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The Development of Commercial Ports

- I. What the Ports of Europe are Doing
II. Chicago's Commercial Opportunity

Report to the
Chicago Harbor Commission
By J. PAUL GOODE

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Letter of Transmittal

To the Chicago Harbor Commission:

GENTLEMEN—I herewith respectfully submit my report on the great seaports of Europe, with suggestions bearing on the question of the development of the water front of Chicago. This report embodies the results of a personal visit to all the ports discussed, an accumulation of the latest official records and maps, and personal interviews with the various harbor authorities.

Sincerely,

J. PAUL GOODE.

The University of Chicago.

November 10, 1908.

Acknowledgments

In every port visited I received the most courteous consideration. The name of Chicago and her Mayor, whom I represented, proved an open sesame. The "freedom of the port" was invariably granted me, and every opportunity given to see and learn of the business of the port. I hereby tender to the following gentlemen, my sincere thanks on behalf of the Chicago Harbor Commission, for generous attention and assistance.

In Liverpool: Mr. Miles Kirk Burton, secretary and general manager; Mr. Alfred Chandler, assistant secretary; and Mr. Anthony George Lyster, chief engineer, of the Mersey Docks and Harbour Board. The Lord Mayor of Liverpool, and Mr. Percy F. Corkhill, the Lord Mayor's secretary. Mr. Allen Milne, secretary of the Liverpool Board of Trade; and the American Consul at Liverpool, Hon. John L. Griffiths.

In Manchester: Mr. F. A. Eyre, secretary Manchester Ship Canal Co.; Mr. Herbert M. Gibson, chief traffic superintendent, and Mr. A. Joynson, assistant traffic superintendent. Professor John MacFarlane of the Victoria University, Manchester.

In Glasgow: Mr. Thomas Riach Mackenzie, secretary and general manager of the Clyde Navigation; Mr. D. M. Macintyre, assistant secretary; Mr. W. M. Alston, chief engineer; and Mr. Wm. Stewart, traffic manager. Mr. Archibald Colville, and Mr. David M. Maclay of the Dalzell Steel Works, Motherwell. Mr. James Gilchrist of the firm of Barclay, Curle & Co., ship and engine builders. Mr. M. Samuel, secretary to the Lord Provost of Glasgow.

In Leith and Edinburgh: Mr. Rufus Fleming, American Consul.

In Newcastle-on-Tyne: Mr. J. McDonald Mansön, secretary and general manager of The Tyne Improvement Commission, and Mr. H. J. Moscrip, assistant secretary. Mr. R. L. Wedgwood, chief goods manager, Northern Division of the N. E. Ry., and Mr. Thomas Edington, assistant goods traffic superintendent.

In London: Hon. Whitelaw Reid, American ambassador; Hon. T. H. W. Pelham, C. B., secretary of the Board of Trade; Mr. J. G. Broodbank, secretary, and Mr. R. Biscoe, assistant secretary of

the London and India Docks Co., and Mr. Charles E. Vernon, chief engineer. Mr. E. H. Bailey, and Capt. T. H. Uren, superintendents Victoria and Albert Docks. Mr. W. B. Duffield, secretary of the Royal Canal Commission and Mr. R. B. Dunwoody, engineer. Mr. G. L. Gomme, clerk, London County Council.

In Bristol: The secretary to the Lord Mayor, Mr. Reed. Mr. F. B. Girdlestone, general manager, and Mr. A. Harvey, assistant manager of the Bristol Docks; Mr. W. T. Shapland, traffic manager of the City Docks; Mr. W. Wilkinson Squire, chief engineer; Mr. G. A. Collins, traffic manager, Avonmouth Docks, and Dr. J. Perry Worden, American Consul.

In Cardiff: Mr. James Hurman, superintendent Cardiff Railway Co., and Mr. W. J. Holloway, assistant superintendent.

In Southampton: Colonel Albert W. Swalm, American Consul; Captain G. H. Lewis of the London and Southwestern Railway. Mr. G. W. Sandell, president Chamber of Commerce, and Mr. Peter Milne Stewart, secretary. Colonel R. C. Hellard, C. B., R. E., of the Ordnance Survey.

In Havre: Mr. Alphonse Gaulin, American Consul. M. Guiffart, chief engineer of the Port of Havre.

In Antwerp: Mr. Henry W. Diederich, American Consul General. M. Gustave Aldbrecht, Alderman of Commerce, and M. Ferdinand Kinart, chief engineer.

In Rotterdam: Colonel S. Listoe, American Consul General. M. de Jongh, city engineer; Mr. H. A. van Ysselsteijn, and Mr. C. Nobel, assistant engineers. Mr. Emil G. Boerner, grain inspector for the American Department of Agriculture.

In Bremen: Mr. Wm. T. Fee, American Consul. Herr Ed. Suling, city building inspector.

In Hamburg: Mr. Otto W. Helmrich, Deputy American Consul General. Captain Fokkes, Marine Inspector, Department of Shipping and Commerce.

I. What the Ports of Europe are Doing

The Function of the Port

A port is a gateway between two transportation realms. On the one hand the open sea with its trackless waste, offering the best and cheapest routes for traffic with all the world; on the other hand the land, with its roadways and inland waterways carrying the commodities of trade to and from the great commercial focus, as the blood is carried to and from the heart in our vascular systems.

A port becomes a great commercial focus in proportion as certain factors are developed which determine the flow of commerce. First: The production of goods in the hinterland, which may find, by way of the port, a market in the world outside. The richer the hinterland, and the larger the flow of goods, the greater the possibilities of the port. Second: In almost equal measure as a hinterland develops its export trade, does it become an active market for the importation of goods from other productive regions, and by so much may the business of the port be increased. Third: Up to the limits of the opportunity offered by its hinterland, a port is great, in proportion as it develops the facilities for the flow of commerce, and reduces the friction incident to the breaking of bulk and the change in the character of the agent of transportation. In the simplest of mechanical metaphor, a port is a pump, the efficiency of which is high in proportion as the stream of liquid commerce it delivers is great, and the cost of operation is low. In just such measure as the pump is poor is the cost of service high and the flow small. A port may offer poor facilities because of (1) geographic, or (2) economic reasons. Examples of geographic controls are plentiful. Such are the tortuous silting channels of the distributaries of the Rhine and Weser; or bars and drifting sand as in the Delaware river, or at Galveston; or in the lack of anchorage and storm protection as at Genoa. The economic handicaps are more numerous, and often more difficult to handle. Such are unreasonable harbor dues, and poor or insufficient harbor construction; and inefficient port administration. If the need for an exit

be urgent enough a great business may be done in spite of inferior accommodations, inefficient administration, or excessive charges.

It frequently happens that a rich region may have several potential ports. Given an option in ports the business gravitates to the point of least obstruction, or greatest advantage. And as always in such cases the Lord is on the side of the strongest battalions. Illustrations we have in good measure in ports serving the rich manufacturing midlands of England, where Liverpool, Manchester, Bristol, London, and Hull are playing the great game, balancing advantages and disadvantages geographic and economic for the prize of freight; in the ports at the mouths of the Rhine, Weser, and Elbe, competing for the rich favors of the German hinterland; or right at home, and on the largest scale, in the struggle between Boston, New York, Philadelphia and Baltimore for the service of the phenomenally productive hinterland west of the Appalachian highland. In the study which follows, an attempt will be made to evaluate the factors geographic and economic, in an interpretation of some of the world's great commercial foci.

Statistical Comparison of the Growth of Ports

As to commercial importance ports may be compared in several ways. For example, in *net register tonnage*. And this either in tonnage entered or cleared, or in the sum of the two. A comparison made on this basis will not be perfectly fair; first, because the rules of registry differ somewhat in the different countries. Then too, the records differ as to whether coasting trade is counted in or not, the practice varying in different lands. And on this score the records are always against American ports, for our coasting trade, which we usually do not count, covers a coast line comparable to that of all Europe, and some of it may make journeys 12,000 miles or over in length. All such traffic in Europe, because of the small size of the European countries, is foreign trade and is counted in. Then again a vessel may take on load in a number of ports, being credited to each in turn, the entire tonnage being credited to a port if only a bag of mail changes hands. In English ports fees are charged for every entrance and in some cases for clearance as well, which encourages the taking on of a complete load at one port. In France, however, the navigation tax is paid but once, and the result is a greater freedom in the routing of ships, the tendency being to call at more than one port. Notwithstanding these drawbacks, the difficulty of getting complete data

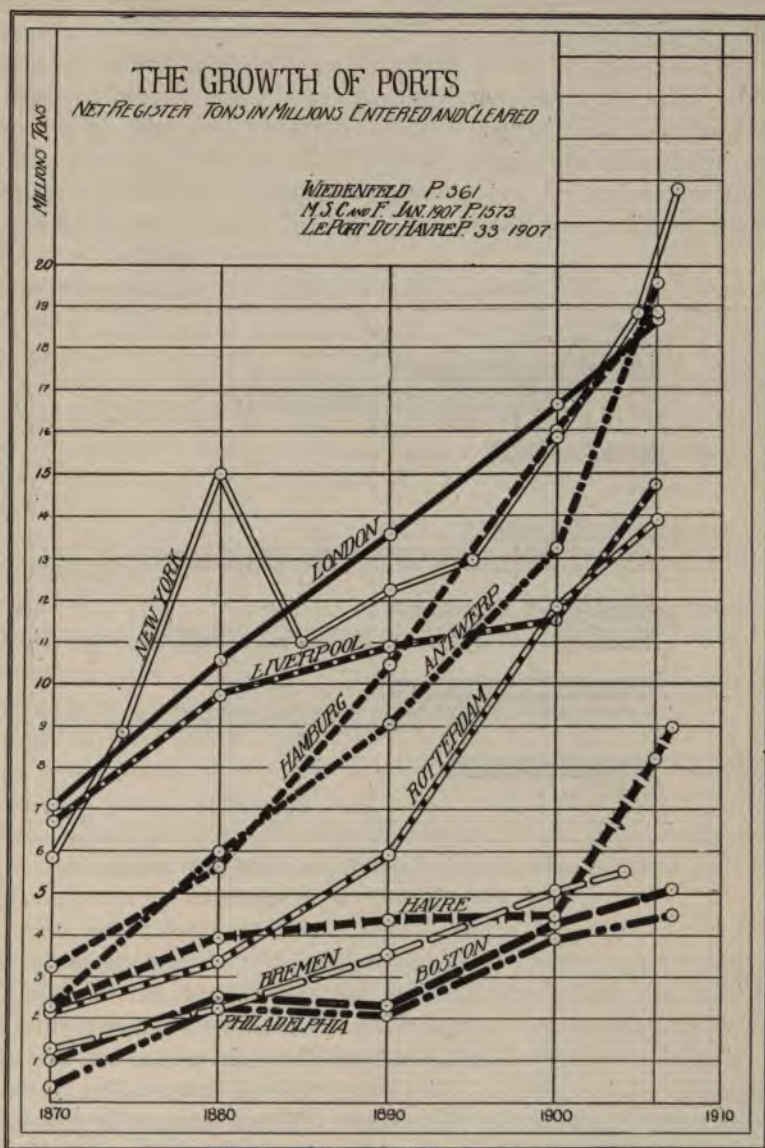


Fig. 1. The growth in tonnage of some of the great ports.

for comparison on other lines, such as the value of the goods, or the actual weight of merchandise handled across the ship's rail, leaves the net register tonnage as the basis of comparison most widely available.

For the purpose of our study we need not go back of the year 1870. This date marks the beginning of the age of steel in transportation; for it is the use of steel in railway rails and equipment, and the introduction of steel in ship-building, which has made the recent vast industrial and commercial expansion possible. Throwing into graphic form the record of growth in net register tonnage

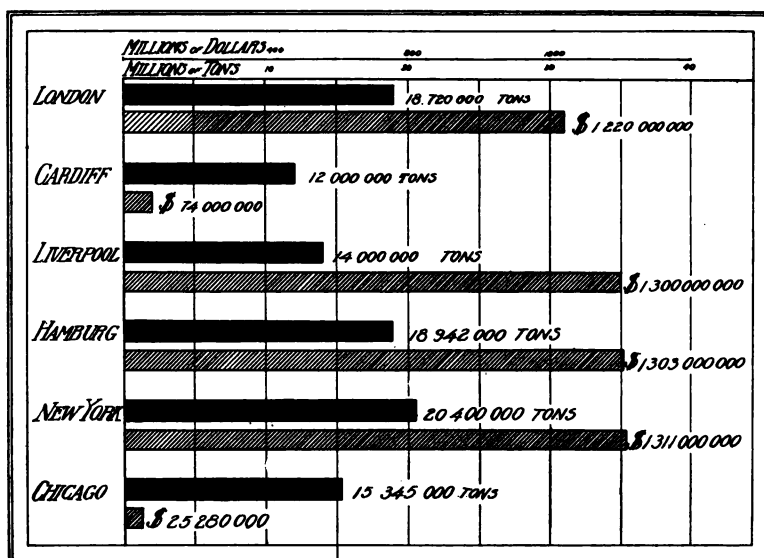


Fig. 2. Comparison in various ports of the net register tonnage and value of goods in foreign commerce.

of some of the world's chief ports (Fig. 1) not only is the great expansion in traffic very striking, but the rate of development is very instructive in the various ports. The adequate interpretation of this series of curves would lay bare all the factors at work, both geographic and economic. The most striking development is that of Antwerp, Hamburg and Rotterdam. These three, with Amsterdam are the gateways for the world trade of Germany. New York is next most striking, but her hinterland is almost the whole continent, and the disparity between New York and Boston-Philadelphia-Baltimore, the other rightful heirs to the same hinterland, is

an open challenge for the rules of the game by which economic handicaps and favors in the traffic of these ports are allotted.

Where a comparison of the value of goods handled can be set alongside the weight of goods handled, or even the net register tonnage, an interesting light is thrown on the character of the trade of the ports.

In the graf (Fig. 2) a selected half dozen ports are arranged in the order of the value of their traffic and compared also as to their tonnage. It is instructive to note the comparison of Cardiff with the other ports. London with only 50 per cent more tonnage than Cardiff, handles goods worth fourteen times as much. This is because the trade of Cardiff is almost wholly the shipping of coal, ships coming in light and going out with coal cargoes of relatively low value. London, Liverpool, Hamburg and New York on the other hand have active imports as well as exports, and both imports and exports are largely of manufactures and other goods of high value. Chicago in this comparison shows relatively low values because the lake trade is largely in coal, iron, lumber, grain, and other raw materials.

Another instructive comparison of ports may be made in the harbor facilities provided for traffic, that is, the extent and quality of the physical equipment. This will include the character of the channel and anchorage; the extent and quality of docks and ships; the quays, piers, cranes, railways, sheds, warehouses, and other means provided to facilitate the handling of ships and freight, and so reduce the time and costs of the process. In these matters there is the widest divergence in practice in the various ports, but this difference is apparently due to differences in administration and the ideals underlying the organization of the port. A discussion later of the organization and administration of ports will be quite relevant to our inquiry.

One other basis of comparison is available, and that is, the growth in population of the city of the port. For the more active and efficient the port, the larger the opportunity for manufacture and trade, and hence the larger the invitation for a city population.

The case of London in this comparison is the most striking of them all. The metropolis of a rich land, with the prestige of centuries of well ordered business, the population has grown at a rapid and surprisingly uniform rate (Fig. 3). New York shows a more rapid increase in the last eighteen years than any other port, and this growth is commensurate with its increase in traffic. The growth of Chicago as compared with New York is somewhat

disappointing. We are not living up to our opportunities, either in traffic, or in growth in numbers. New York has her network of railways just as Chicago has, but has also her marvelous ocean traffic, which Chicago may some day have, but has not yet achieved.

The case of Liverpool is quite instructive. While the population of New York in the last 38 years has quadrupled, the population of Liverpool has only doubled. But that is because Liverpool has been content to serve merely as a gateway to the rich hinter-

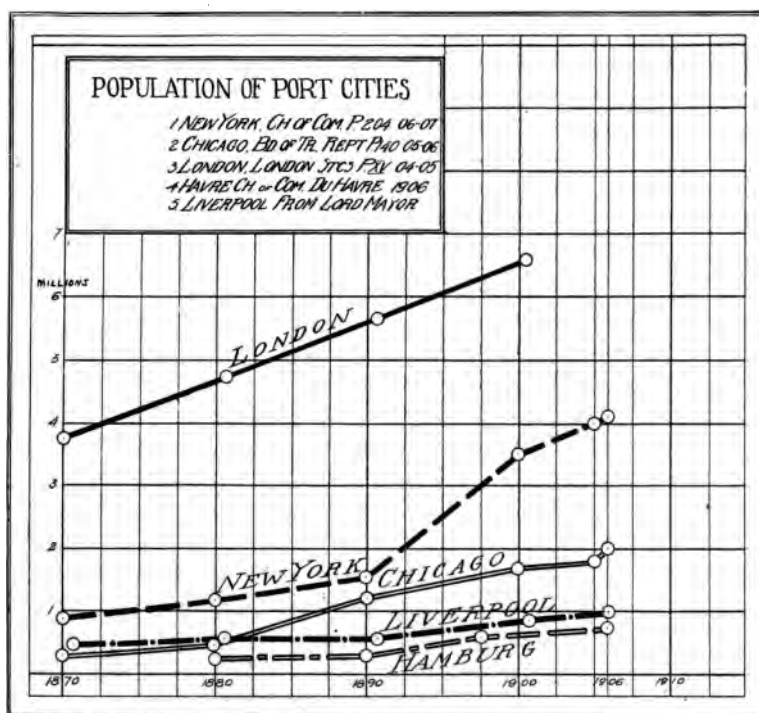


Fig. 3. Map showing the population of selected port cities, through a period of years.

land of the Midlands. But little attention has been paid to the development of manufacture, which the advantages of the port would warrant. Hamburg, with a curve quite similar to that of Liverpool, makes a much more creditable showing, for in 1866 Hamburg was only a river village. In the one generation since then the port has risen to third in rank in all the world, on the basis of tonnage, surpassing London, and with every promise of holding the vantage won. Hamburg is now making vigorous effort

to establish manufactures in the port, and it will not be long before the city in population will rank above that of Liverpool, as her traffic for some years has done.

An Economic Interpretation of a Few Great Ports

It will be helpful as a basis for the understanding of our own port, and its possibilities, to make a somewhat careful examination of some of the world's leading ports. For convenience we may study each port:

- (1) With reference to the hinterland it serves;
- (2) As to organization and administration;
- (3) As to port facilities for handling traffic;
- (4) As related to inland systems of transportation, street, railway and waterway.

The English Midlands

Let us take first the ports serving the English Midlands. The bank account of British Industry is her magnificent resource of



Fig. 4. The midlands and the coal fields of England.

coal. This is the force which turns the spindles, forges the steel, and converts the raw products of half the earth into the manufactured articles of high value for the markets of all the world.

It is the coal of the Midlands (see Fig. 4) which calls for the ores of Spain, the lumber of Canada and Africa, and the wheat and meat of America and the Argentine to feed the working millions. So trade in great volume flows to and from the Midlands rich in coal. The natural ports for this region are in the river mouths draining the area and the ports in active competition for the business of the region are Liverpool, Manchester, Hull, Newcastle, and Bristol, with London reaching long arms after a share of the traffic.

Liverpool

The most important of these ports is Liverpool. Situated on the estuary at the mouth of the River Mersey, Liverpool is the logical gateway of the western half of the Midlands. It also reaps the advantage of being on the side of England next to America, from which the cotton has come for the spinners of Lancashire, and from which the food has largely come for the manufacturing population.

While the estuary furnishes an ample anchorage protected from the winds and violence of the open sea, and in so far was a natural harbor, it is very heavily handicapped, in opening directly toward the advancing tidal wave of the Atlantic. This gives a tidal range of 31 feet, and makes the problem of shifting sand bars an extremely difficult one to face. Yet the advantage of position is so great, and the organization of the port authority so effective that the difficulties have been met, and a port developed which in many respects has no peer on earth. This success is mainly attributable to the form of organization and method of administration of the port, and it will be worth our while to give a somewhat detailed account of the port administration in this case.

The Port Administration. Prior to the year 1857 the docks and works in connection therewith on the Liverpool side of the Mersey were under the control of a Dock Committee, subject to the Town Council of Liverpool. The docks on the Birkenhead side of the river had been managed by a private company, but later had been acquired by the city of Liverpool. By the Mersey Docks and Harbour Act of 1857 the control and management of all the docks at Liverpool and Birkenhead become vested in a Public Trust called "The Mersey Docks and Harbour Board." This Board consists of twenty-eight members, of whom four are appointed by the Crown, and twenty-four are elected by the dock ratepayers. The term of membership, whether by appointment or election, is four

years, with privilege of re-appointment or re-election. The members elected by the Dock Ratepayers must reside within the customs port of Liverpool, or within 10 miles of the outward boundary of the Borough. A candidate "must pay to the Board within the year immediately preceding his election, rates in respect of ships or goods of not less than £25." Members receive no remuneration.

The qualification of an elector is the payment, without regard to the place in which his business is carried on, of rates on ships

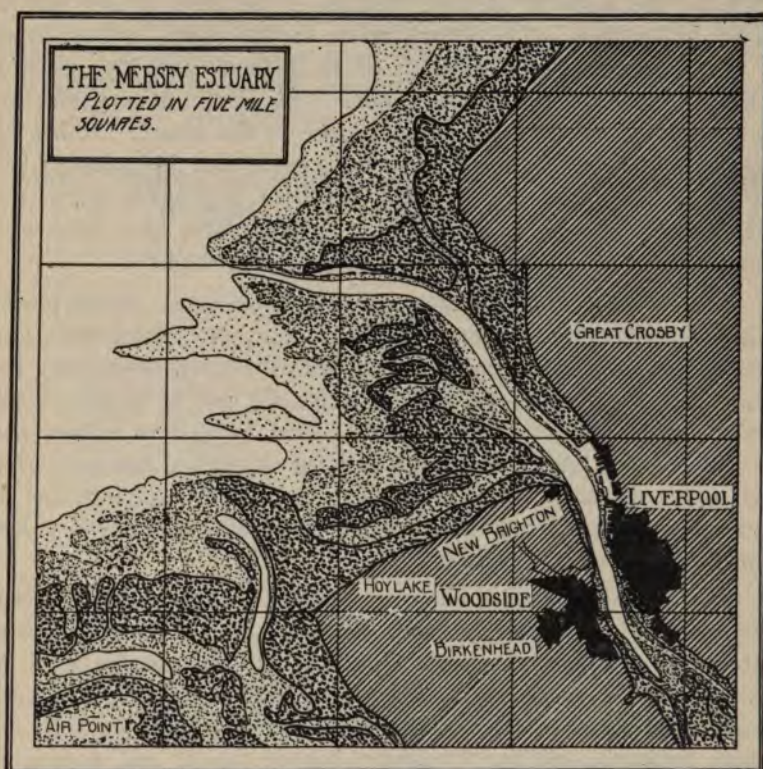


Fig. 5. The Mersey Estuary and the channel across the bar.

or goods, of not less and £10 in the year preceding the election. He must be a British subject, or if a foreigner be resident in the United Kingdom and his name must be on the list of dock electors. There is only one vote for each member to be elected, and there is no voting by proxy.

No member may hold any office or place of profit under the Board, or may participate in the profits of any work done by the

Board, or in any contract entered into by the Board. Exceptions to this are made in the case of water or gas or lands supplied to the Board by sale or lease, or money loaned to the Board. But on any such transaction a member may not vote.

The Board being a corporate body, holds property and transacts business like any other individual, under regulations prescribed by Parliament. All the property of the Board is considered as one estate and is managed as such. Taxes are paid upon this estate on the basis of income, just as in the case of any private person or business. The Board raises capital funds by borrowing on bond issues, on the security of its income, and lays aside a sinking fund to retire these bonds. This form of organization has given the maximum of independence to the Board. It has always had funds enough and it spends on its own judgment, without let or hindrance. No greater freedom is possible anywhere, and all evidence goes to show that its powers have been used with great wisdom and discretion for the good of the port.

The Board has an absolute monopoly in the port. It has power to license and regulate pilots, and fix pilotage rates; to impose and collect dues on goods handled to or from the town or country beyond; and to fix rates and fees on ships for use of harbor, dock, berths, quays and equipment. The Board lights the harbor and the estuary, and at an enormous cost for dredging, has converted what was originally "a creek of the port of Chester," into one of the most important ports in the world, with a 35 foot channel at low water, out across the bar.

The Board elects its chairman, and delegates work to committees. It meets regularly every Thursday, and most of the committees have weekly meetings. Though no salaries are paid to members, the most earnest service is rendered. There is a very considerable corps of paid officials: the general manager and secretary, engineer, solicitor, treasurer, harbor master and assistants, accountants, receivers, auditors, marine surveyors, bailiffs, police, inspectors, watchmen, laborers, etc., a small army in all.

It will be instructive to see in some detail how the Board acquires and spends its income. The fiscal year closes July 1, and Parliament requires the publication of a detailed account of receipts and expenditures. This report is issued very promptly and is a model of its kind. Power to borrow on bond issue has been granted by various Parliamentary acts from 1859 to 1906, and bonds have been issued at various rates of interest from 4½ per

cent to as low as $2\frac{1}{2}$ per cent. The total borrowing power granted up to July 1, 1907, was:—

Amount authorized	£31,886,695- 2-10
Amount borrowed	24,559,817-14- 2
	<hr/>
Balance, power unused.....	£ 7,326,877- 8-10

The total amount expended by the Board from 1859 to July 1, 1907, was £29,990,150 -0 -8, or about \$150,000,000. The amount set aside for the sinking fund account in 1906-7 was a half million dollars. During the same year the engineering work cost over \$1,000,000. The table of general receipts and expenditures for the year will be instructive:—

Mersey Docks and Harbour Board—Statement of General Receipts and Expenditures—Year Ending July 1, 1907

DR.

To interest	£ 904,799-12- 6
Engineers' Dept.	233,934- 2- 8
Harbor Master's account	46,969-14-10
Dock Traffic Dept., Ry., Weighing, etc..	152,439- 8- 1
Police expenses	45,562-16- 2
General charges	97,857-16-10
Parliamentary and law expenses.....	1,992-16-10
Rates and taxes	91,484- 4- 7
Fire insurance and depreciation of vessels	77,979-16- 1
Grant to Conservancy Acct. dredging...	6,600- 0- 0
	<hr/>
	£1,659,620- 8- 7

Balance—

Amount carried to sinking fund	£100,000- 0- 0
To unappropriated receipts account	32,561-15- 4
	<hr/>
	132,561-15- 4
	<hr/>
Total	£1,792,182- 3-11

CR..

By rates and dues.....	£1,359,026- 3- 3
By rents of property ...	164,210- 6- 9
By Dock Traffic Dept., Ry., etc.	184,663-14- 1
	<hr/>
	£1,707,900- 4- 1
By warehouses surplus..	84,281-19-10
	<hr/>
Total	£1,792,182- 3-11

And a further analysis of the one big item of income, Rates and Dues, will not be amiss.

General Receipts, Year Ending July 1, 1907

CR.

By Rates and Dues—

Rates received on vessels:

Dock tonnage rates	£ 699,105-19-10
Graving dock, and gridiron rates....	40,292- 0- 9
Dock rent	7,931- 3-10

Rates and dues received on goods:

Dock rates	369,875- 7- 9
Town dues	314,702-18- 2

Less dock tonnage rates applicable to

Conservancy Acct.	73,022-18- 1
------------------------	--------------

Total £1,358,884-12- 3

This handsome revenue of nearly \$7,000,000 is the culminating term in a long record of gradual growth almost entirely free from retrograde steps. The figures are available for every year since 1752. Charted (Fig. 6), we can see at a glance, the phenomenal development of this port. With the introduction of iron ships the business of the port went up with a bound. The depression of the American Civil War is very conspicuous. Too much prosperity brought the agitation for a canal to Manchester and a reduction in charges, lowering the income and flattening out the curve. But since 1900 the old rate of increase has been resumed.

The dues and charges in this port are very high, but since this is the common practice all over Britain, it is a difficulty the shipper and merchant can not evade. It is established custom. The general government practically turns over its powers to the port. It neither lights nor buoys nor dredges the harbor or channel out to sea. All the prodigious work of making a port in the teeth of a tidal range of 31 feet, and the silting of the estuary, and the shifting sands on the submerged delta, has fallen upon this unaided corporation. Not a dollar has come from government nor from the city. By the method of selection the members of the Board are the most alert and able business men of the region. Men whose daily lives are devoted to business which is dependent upon the administration of the port, and whose business success is part of the success of the port management. On every hand in Liverpool one hears the highest praise for the Board. In business it is considered the highest honor a man may earn to be given a seat on the Board.

One gentleman described the honor as so much coveted that a well advised young man would shape every act from his first day in the business world with reference to this possible future goal. Though no remuneration of any kind is given for service, there is seldom a vacant seat at the weekly meetings of the Board.

The paid officials are of the highest type. The position of general manager is as responsible as the presidency of one of our greatest railways, and requires as rare ability. The chief engineer has problems as difficult to handle as are met with in the science. Such able men, tried and proved, hold their positions indefinitely,

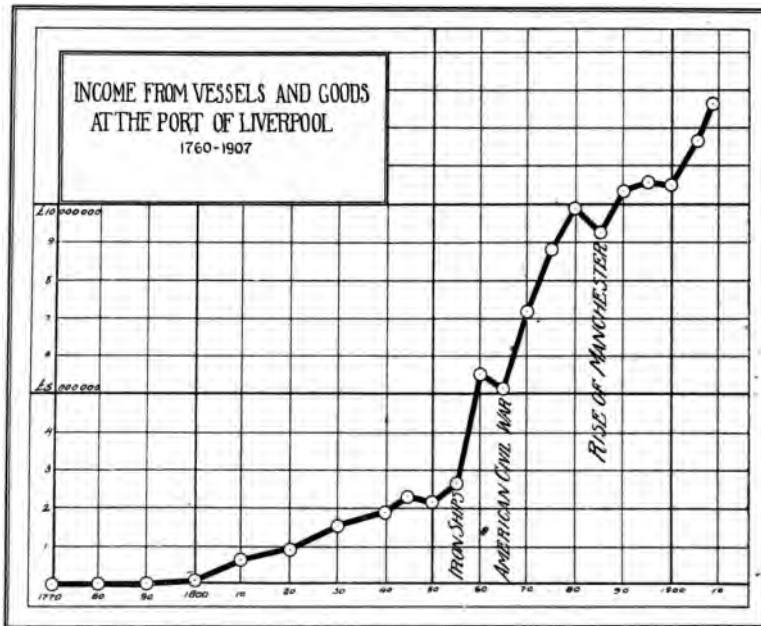


Fig. 6. The earnings of the Port of Liverpool, 1760-1907.

at the pleasure of the Board. The present general manager, Miles Kirk Burton, Esq., a man of superb efficiency, has held his position for a generation. The chief engineer, Anthony George Lyster, Esq., a man of the highest ability, grew up in the problems of the harbor, his father before him being chief engineer for a long term of years. Mr. Lyster is putting into commission at the present time a monster sand pump dredge, which will lift 10,000 tons of sand in 50 minutes into its own hold, and steam out to sea and scuttle its load. This dredge, more than twice as large as the next largest in the world is only an incident in the problem of maintain-

ing a channel across the bar so that the largest Atlantic liners may make their port at any stage of tide. Liverpool is the home port of the great Cunarders, Mauretania and Lusitania. There are only three or four ports in the world that can take boats of this size, and yet the far sighted gentlemen of the Mersey Docks and Harbour Board see plainly that there will be larger boats yet. And as an illustration of the simplicity and freedom of the organization of such a board, it will be instructive to see how easily a great improvement is undertaken. Discussing the growth of commerce, the need of a larger dock was seen. The engineer provided plans and estimates, which after mature deliberation were approved, and without asking the permission or approval or support of anybody, except a parliamentary permit for general harbor improvement, an extension was voted April 30, 1907 to provide a dock with berths for four ships at once, with lengths up to 1,100 feet, and 120 feet beam; and with quays, sheds, railway tracks, and driveways accompanying — involving an expenditure of \$16,000,000. So when the larger ships arrive, Liverpool will have room and welcome for them.

This freedom in organization has resulted in a port of the highest excellence in plan, construction, and management. The 31 feet range of tide makes it necessary to provide docks with locks and gates, which will let ships enter with the sea at any level, and give berthage in docks and basins, with water at a fixed level. Such gates are enormously expensive, nearly one half the cost of the latest \$16,000,000 extension being in the gates. Moreover it is the practice of the Board to make all construction of the most durable sort; quay walls of masonry, or concrete, and coping of granite; sheds of steel, or brick, or concrete, with slate or tile roof. Everything is fire proof, and built for all time. Landing for ferries and Atlantic liners is affected at any stage of tide by great floating piers, connected with the shore by inclined bridges. The main landing stage at Liverpool where the transatlantic liners embark or disembark passengers is 2,478 feet long, with eight bridges connecting it with the shore. Here the railway comes to the water's edge and passengers and their baggage are transferred under cover directly from ship to boat or vice versa. For loading or unloading freight, the vessels must be locked in or out of the docks.

Under such conditions each unit of dock space is worked as efficiently as possible, and docks and basins are no larger than is necessary to do the work of the port. On January 1, 1908, there were in Liverpool 53 docks and 16 dry docks, and in Birkenhead, 8 docks and 3 dry docks. The total water area of the docks and

basins in Liverpool and Birkenhead was 583 acres 1,115 yards, with a lineal quayage of 36 miles 255 yards. The total area of the Dock Estate, exclusive of undeveloped fore-shore was 1677½ acres. Upon this estate the government assessment as a basis for the income tax is £940,000 a year, that is, the government assumes that the Board's annual income is \$4,700,000.

In addition to supplying docks and sheds, the Board has many warehouses for various sorts of goods, where stocks may lie for almost any length of time, the merchant paying storage. The new tobacco warehouse at Stanley Dock is 723 feet by 165 feet, and 13 stories high. It is of brick, with steel beams and posts and concrete floor. It has a capacity of 66,000 hogsheads of tobacco, and a great deal of tobacco lies in storage for years before being used. There are other great warehouses for salt, grain, wool, hides, oil, etc., and from all these the Board derives an income.

Another source of income is in the carting of goods from the quay to the railway, or the reverse. In Liverpool the most conspicuous feature of the work of the docks is that everything with the exception of coal and bulk oil, is handled to and from the ship on horse drawn drays, or "lurries" as they are called. In 1901 it was estimated that over 90 per cent of the total traffic of the port was handled by these horse carts. And even so the charge for handling was very low, only a shilling a ton, while in London where railway carriage is much more in use, the cost of handling ran to several times that. In Liverpool since 1901 there has been a rapid extension of railway tracks to serve sheds and quays, all the newer installations providing for the transfer of goods to and from the car direct. These tracks are built and owned by the Board, and a number of switching engines are provided also by the Board to handle the cars in and out. The total railway trackage on the estate in June, 1908, was 80 miles. No charges are made for the use of these tracks, and under special stress the locomotives of the great railway systems bring in or take out trains through the Dock Estate.

Inland transportation between Liverpool and the hinterland is almost wholly done by the railways. There is a canal connecting with the network of canals of the Midlands, but it plays but a sorry part in the total traffic of the port. The rise of Manchester as a sea port, has practically canceled what might otherwise have been a considerable barge traffic up the Mersey, for with the canal in operation vessels go to their dock at Manchester and intervening points without lightering.

Manchester

The case of Manchester is intensely interesting and full of significance for us in Chicago. For Manchester is an example of a seaport created to order. An example of whole hearted and intense battle on the part of a community to be free of railway and other impositions upon her commerce. The men of Manchester felt that too large a toll was levied at Liverpool and other ports, upon the cotton and sugar and timber and other commodities brought in, and upon the manufactures shipped out.

Manchester is the focus of the vast cotton interests of Lancashire, Derby and York, one of the busiest parts of the midlands. In the Manchester Exchange there are representatives of 177 towns, eleven of which have each a population of 100,000 or over. The city is more like Chicago in its rush and grime and the magnitude of its undertakings than any other city in Britain. The Manchester Chamber of Commerce is a body of men the peer of such bodies anywhere. It was the vigorous activity of this chamber, and of the Manchester Commercial Association, more than anything else, which was instrumental in compelling the establishment of the Public Port Trust in Liverpool in 1857, taking the matter out of the hands of the City of Liverpool. By 1880 they realized that they were not getting the advantages in transportation they were entitled to, so they began an agitation for a ship canal, which should make their own town a seaport of the first rank. The entire city came to the support of the venture and subscribed liberally to the fund necessary to go to Parliament for powers. The problem was infinitely difficult. For to get an enabling act with powers adequate they had to do battle royal with all the railways in the region, with all the shipping interests of Liverpool, with all the land owners along the 35½ miles of the canal route, with various small towns with rights in waterways which would be changed, and with every other vested interest which could be brought to bear against them. Twice they were defeated in Parliament by the vested interests, but the third time they won, and it cost \$750,000 to get past Parliament. It should be food for thought in America that in all this parliamentary warfare not one whisper or suspicion of graft or unfair play was ever raised on either side. The bill provided an organization which is somewhat anomalous in port administration, that of a stock company—the Manchester Ship Canal Company—the stockholders choosing the officers and determining the policies. But the purpose was avowedly to serve the common good; not to work for profit, but to establish

fair play in the handling of goods to and from the city. In effect it was a public trust seeking the same powers as the Docks and Harbor Board at Liverpool. When, August 6, 1885, their bill became a law, their stocks were subscribed by a patriotic public to the extent of nearly \$50,000,000, and work was begun. But the engineering difficulties and costs were greater than could be foreseen, and the company was compelled to ask the Corporation of Manchester to come to their assistance with a loan. The city furnished the loan, and later another, a total of \$25,000,000. But the canal was not opened for traffic to Manchester until November, 1893, and with no earnings the interest on the city loans fell into arrears, and a new obligation of over \$5,000,000 was incurred for interest. The city then demanded and obtained representation on the board of directors, so that the directorate now stands:

10 elected by the shareholders.

11 appointed by the Manchester Corporation.

Shareholders have one vote for each share up to 10; one extra for each additional 5 shares up to 100; and one extra for every 10 beyond. The chairman is chosen by his colleagues from amongst the ten directors elected by the shareholders. The shareholder directors hold office for three years and are eligible for re-election. The corporation directors are chosen by the city council, the term of office limited to the term for which they are elected to the council—aldermen six years, councillors three years.

The chairman of the company devotes the whole of his time to the affairs of the company and is remunerated accordingly. In addition to this \$10,000 per year is distributed pro rata amongst the remaining directors according to attendance.

Thus at the present the control is dominantly, though indirectly, municipal. The Canal Company is now paying all interest, and will soon be paying off the city loan. When this shall be reduced to \$12,500,000, the city will appoint seven directors only; and when the debt is all paid, the directorate will be reduced to 15, two of which shall be appointed by the city corporation.

It was a gigantic venture to bring a channel 290 to 370 feet in width at the top and 120 to 170 feet at bottom and 26 feet deep from the sea $35\frac{1}{2}$ miles into the land, and lift it sixty feet and six inches. Forty-six hundred acres of land had to be bought, at a cost of \$6,435,025, and the Bridgewater Canal, which crossed the right of way, and another canal, the Mersey and Irwell Navigation, had to be bought at a cost of over \$6,000,000. Five railway crossings were provided with high level bridges, 75 feet in the clear, ap-

proaches graded to 1 in 135. The total excavation was over 51,000,000 cubic yards, or over half that of the Suez Canal. The magnitude of the undertaking may be seen by a statement of the capital created by the company:

Capital Created by the Manchester Canal Company

To June 30, 1907.

Manchester Ship Canal Acts 1885-6.....	£ 9,812,000
Manchester Chip Canal Acts 1890	600,000
Manchester Ship Canal Acts 1891	3,000,000
Manchester Ship Canal Acts 1893	2,000,000
Manchester Ship Canal Acts 1897	100,000
Manchester Ship Canal Acts 1904	1,572,281

Total capital £17,084,281

When Chicago made the drainage canal it was a great undertaking and all the world heard of it. But Manchester, with only a fraction of the population or wealth of Chicago, has raised over \$85,000,000, which is considerably more than the investment of our great canal. Upon the capital created by loans and debenture stock, \$50,000,000 is at 3 1-5 per cent; \$15,590,000 at 3½ per cent, and \$10,980,000 at 4 per cent. This burden is now being carried, and it is expected that this year a small dividend will be paid upon common stock. The semi-annual meetings of the directors are held in the Town Hall, and are occasions of very great local interest. A public statement is there made of the half year's business and of the financial status of the company. As in Liverpool, the itemized accounts of the year's receipts and disbursements are public property.

The Manchester Ship Canal Company was organized with the advantage of the knowledge of a century's experience in expansion in the ports of Britain. It is very instructive to notice that from the first the plan was for a complete monopoly of the business of the port. There was complete freedom within the common restrictions imposed by Parliament upon all ports, in assessment and collection of dues and fees. The docks, piers, wharves, quays, sheds, warehouses, railway tracks, locomotives, cars, luries, motor trucks, cranes, pipes, chutes, legs, shears, floats, tugs, scows, barges, lighters, pontoons, flats and all the other devices used in handling the freight to and from the ships are owned and worked by the company. Vessels are loaded or unloaded by the owners of the cargo if they wish, and if not, by the company, but the work is done almost wholly by the company. The labor situation is much improved by having but

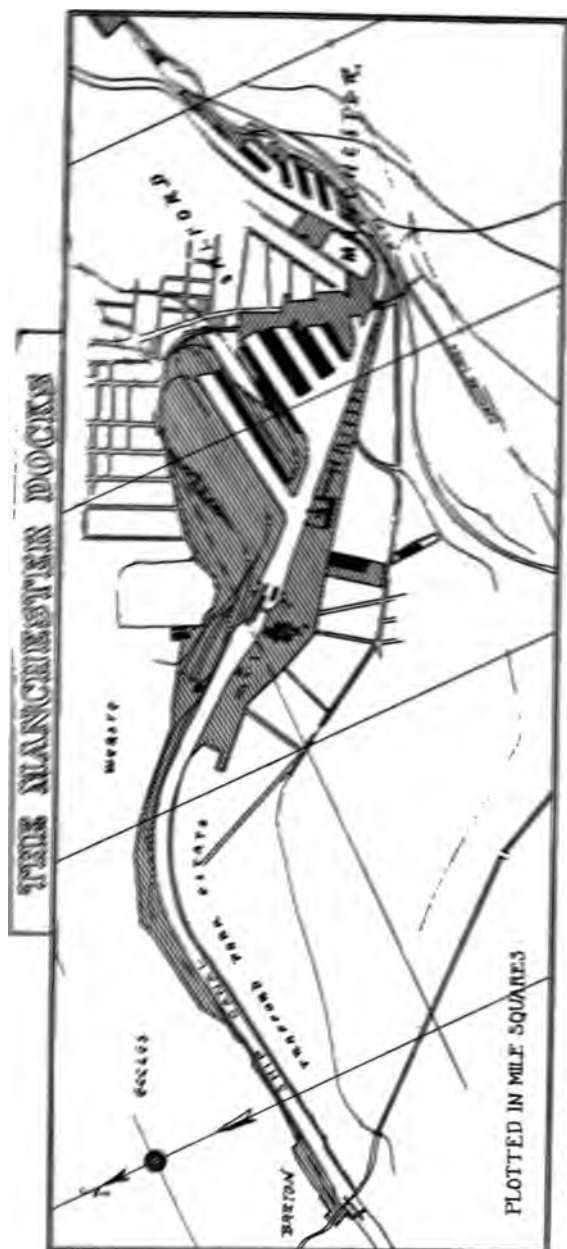


Fig. 8. The major part of the dock facilities are in the City of Balford on the right bank, or in the western edge of the City of Manchester on the left bank of the canal. The Trafford Park estate is now being developed as factory sites and for various commercial purposes. The city is rapidly growing westward.

one employer in the port. It is possible to increase the number of men given continuous work through the year, so reducing the number of casual laborers so much a problem in all the ports of the world. Hence the quality of labor is kept at a much higher level, and strikes are almost unknown.

As is usual in Britain and the continent, the quality of construction is high. Quay walls are of masonry or concrete, faced with vitrified paving brick and coped with great blocks of granite. Sheds are wide, of brick, or better, of ferro-concrete, the best type being four or five stories high, the roof flat and of concrete, carrying the traveling cranes, and available for storage of lumber, casks or other goods which can stand the weather. The cranes are electric, either on the roof or on the tracks on the quay, and are most efficient. Railway tracks are provided on every quay for direct loading or unloading—tracks also through the sheds to be served from the sorting floors. The company owns its own cars and locomotives and does its own switching and has ample siding yards where trains are made up. In case the railway companies are too slow in taking away the loaded trains, the company may take them out by their own locomotives over the right of way of the delinquent company. The freight situation is controlled by the company absolutely.

As constructed, 26 feet was the deepest draft permitted in the canal. But within the present year this has been deepened to 28 feet by holding in two feet more above the tide gates in the lower reach, and by dredging in the upper reaches. This gives a cargo capacity for 360 days of over 150,000,000 tons, for over 70 vessels a day can pass the locks.

All this prodigious outlay of \$85,000,000 and over was made by the people of Manchester and vicinity because they felt that the port charges at Liverpool were too high, and that the railway charges between Liverpool and Manchester were unjust. "A working district as big as a small nation made this supreme effort in a determination to break a grinding and increasingly indifferent monopoly." Manchester is now the nearest port for a population of 8,000,000 people. The battle is won. And it is instructive to notice what happened to freight rates so soon as the canal was assured. I quote from the evidence of Mr. J. K. Bythell, chairman of the Manchester Ship Canal Company, before the Royal Commission on Canals and Waterways, the 67th day, Tuesday, November 26, 1907: (Minutes of Evidence, p. 22.)

"On the promotion of the ship canal in the early eighties the following reductions in the class rates between Liverpool and Man-

chester were made by the railway companies: Class C, from 7s 6d to 7s, station to station; Class 1, from 8s 4d to 7s 11d; Class 2, from 10s to 9s 2d; Class 3, from 11s 8d to 10s 10d; Class 5 was reduced from 17s 6d to 17s 2d in 1893 (the year before the ship canal was completed). No changes were made in the rates for Classes B and 4. Reductions were also made in the exceptional rates in the early eighties in respect of important articles: Cotton from Liverpool to Manchester was reduced from 9s to 7s 2d; cotton goods and yarns for export, Manchester to Liverpool, from 10s to 8s, collected at Manchester; timber, Liverpool to Manchester, from 7s 11d to 6s 8d, in two-ton lots, station to station. The rates charged as above stated are in operation today. Since the canal was opened a few exceptional rates have been made for special cases, but it may be said that the rates between Manchester and Liverpool have practically remained unchanged. Between Manchester and northern European ports, via East coast ports, there has been, however, a large reduction in the combined rail and steamer rates. This is where the competition is the keenest. Before the ship canal was opened for traffic the charge for cotton yarn from Manchester to Rotterdam was 32s 6d. It has been reduced to 22s 10d.

"Machinery in parts, packed in cases, Manchester to Hamburg, has been reduced from 27s 6d to 17s 6d. Sugar from Hamburg to Manchester has been reduced from 21s 9d to 12s 6d. These are typical examples. It may be said in round terms that the rates for other articles have been reduced proportionately.

"Some of the Liverpool dock rates have also been considerably reduced in competition with the ship canal. During the progress of the first ship canal bill in Parliament, the dock due on cotton was reduced from 3s 6d to 3s per ton. As soon as the port of Manchester began to draw cotton the rate was reduced to 2s. As soon as Manchester began to draw grain, the following reductions were made: The dock dues on heavy grain (wheat and maize) were reduced from 1s 4d per ton to 1s at Liverpool and to 6d at Birkenhead."

The Manchester people have won their case, but it has required the keenest and most courageous fighting. After they began to handle freight they were discriminated against by the railways, and were in a good way to fail for lack of power in the control of freight movement. They had to appeal to the Railway Commission and try a case in court before they could get recognition from the railways as a statutory railway company, competent to make rates. They now work as a terminal railway and negotiate business from

individual shippers, furnishing them through rates to or from any point on earth, every expense and terminal charge included, and they can demonstrate a cheaper rate in the region they serve than the shipper can get via Liverpool. It will be worth our while to record a special case or so taken from the books of the canal company.

(1) December 4, 1907, Shipment of Cotton, Memphis, Tenn., to Oldham, Eng., in Cents per 100 Pounds

Via Manchester

Memphis-New Orleans, f. o. b. S. S.....	27.00
New Orleans-Liverpool	38.00
Manchester-Oldham, railway and all port charges..	10.45

75.45

Via Liverpool

Memphis-New Orleans, f. o. b. S. S.....	27.00
New Orleans-Liverpool	38.00
Liverpool dock and town dues.....	2.14
Master porter	1.25
Cartage to railway station.....	1.34
Railway Liverpool-Oldham	9.82

79.55

The Liverpool total rate.....	79.55
Minus Manchester total rate.....	75.45

A saving of..... 4.10

That is, the spinner at Oldham can save by the Manchester route 91.84c per ton of 2,240 pounds. But this is not all, for there is a forwarding charge at Liverpool of 25c per ton, and some extra insurance.

**(2) December 21, 1907—150 Bbl. Cotton Seed Oil Soap, Norfolk, Va., to Manchester, via New York—
in Cents per 100 Pounds**

Via Manchester

Railway Norfolk-New York, per 100 lbs.....	12.00
New York-Manchester	16.88
Manchester Canal dues	4.29
Quay portorage (3 days) dd. to cart.....	1.70
Cartage to works.....	2.14

Total 37.01

Via Liverpool

Railway Norfolk-New York, per 100 lbs.....	12.00
New York-Manchester	16.88
Liverpool dock and town dues.....	1.875
Master porter (shed, etc.).....	.893
Cartage to railway.....	1.340
Railway Liverpool-Manchester	8.040
Cartage to works.....	2.140
	<hr/>
	43.168

This shows a saving of 6.158c via the port of Manchester, or \$1.379 per ton of 2,240 pounds.

It may seem surprising that with these advantages put before a merchant, the port of Manchester does not at once take the lion's share of the port traffic from Liverpool. But there are reasons, one of which when stated will sound very familiar to American ears. There are associations in Britain, among transportation interests, called shipping rings. A Royal Commission has been investigating them. During the first three days of the hearings a year ago Mr. Langdon, the chairman of the Manchester Chamber of Commerce, was on the stand, and testified that there is a conference of Liverpool steamship lines which gives rebates to shippers at the end of each six months, provided such shippers have not in the meantime patronized any vessel going to points served by ships owned by members of the conference. This rebate is large enough to make most of the shippers "be good." Further, "the cost of shipping goods at Manchester amounts to six shillings per ton (two shillings for cartage from warehouse to docks and four shillings ship canal toll). The cost of sending these goods by rail to Liverpool and putting them on board is ten shillings and three pence. The ships in the conference are compelled to charge the latter sum, whether the goods are shipped at Manchester or Liverpool. There is, therefore, no inducement for them to come to Manchester." (Quoted from a paper on the Manchester Ship Canal, by Prof. J. McFarlane of the Victoria University of Manchester, 1908.)

So for many reasons it has been a slow business to build up a port where there was no port before. When at first the ships owned and trading at Liverpool would not come to Manchester, the merchants of the city built ships of their own and established lines to America and Africa and South America, and the venture was a success. There are now seventy large steel steamships owned by the Manchester merchants plying from the home port.

There is nothing else in commerce so inert as the place of a market. The cotton market is in Liverpool, and there it stays, though the spinning is done in the Manchester district. It is only individual spinners' orders that come to Manchester. But other markets are coming. The port is now the first mineral oil market in the kingdom. The tropical fruit, grain, lumber and paper stock markets are growing rapidly. The following tables showing growth in the traffic of the port will be valuable:

Weight of Merchandise Passing Through the Ship Canal*

	Tons.
1894	925,659
1895	1,358,875
1896	1,826,237
1897	2,065,815
1898	2,595,585
1899	2,778,108
1900	3,060,516
1901	2,942,393
1902	3,418,059
1903	3,846,895
1904	3,917,578
1905	4,253,354
1906	4,700,924
1907**	5,201,500

*Manchester Guardian, December 31, 1907.

**Partly estimated.

Manchester Ship Canal Revenues

(In half years.)

1894	£ 44,308	1899	124,183
	53,593		140,592
1895	63,037	1900	141,346
	74,437		149,484
1896	81,214	1901	146,508
	101,116		163,009
1897	97,330	1902	166,603
	107,334		191,888
1898	105,865	1903	189,422
	129,530		207,603

1904	198,548	1906	233,176
	219,495		265,661
1905	208,745	1907*	248,333
	241,691		

*First half year.

From Manchester Guardian, December 31, 1907.

The annual income, which has crept steadily up to about \$2,500,-000, shows in its very regular increase a comfortable promise for the future. Viewed as a stock company merely, it must be considered a success. It is carrying its load, including a sinking fund, and with this year hopes to begin payment of dividends on common stock. It has accomplished very great and permanent reductions in the freight charges for the traffic of the region. There are no two opinions about its success among the people of Manchester. The Manchester Co-operative Wholesale Society stated officially before the canal had been in operation eight months that their subscription of \$100,000 had been very nearly recovered by the savings in freight rates. This company had an annual turn-over in 1907 of \$470,000,-000, and in each semi-annual report writes off a very large sum as saved by the canal.

Two other specific cases will be valuable as object lessons for the merchants of Chicago. The paper mill of Chadwick and Taylor was doing business in Manchester before the canal came. They paid 7-6 per ton on paper pulp via Liverpool. Now they pay 3-6, a saving of 4-0, or \$1.00 per ton. They used in 1907 43,000 tons of pulp, and have used an average of 25,000 tons per year for the fourteen years the canal has been in operation. They have saved in this time, because of the canal, \$350,000.

Rylands & Sons, one of the large local firms in the manufacture and sale of cotton goods, have estimated that in the first three years the canal was open their saving in freight charges was \$95,000. At this rate this one firm has saved since the canal has been in operation \$1,330,000. And there are many such cases.

It would be very interesting to compute what the merchants of Chicago would save by the establishment of a ship canal to the sea, by way of Erie canal, or Montreal or New Orleans.

The Tyne Ports

At the extreme northeastern end of the rich coal bearing English midlands the river Tyne invites a series of harbors, chief of which is Newcastle, one of the oldest ports in Britain. The river has always been famous for its export of coal, though now it is surpassed in this regard by Cardiff. Most of the coal goes to the other ports of Britain and of Northwest Europe. The river has the sinuosities of old age entrenched in a fairly resistant sandstone, and a recent slight crustal depression has partly drowned the young valley. The Tyne is about the size of the Chicago river, the channel being only 250 feet wide at Newcastle, though it widens to 700 feet at Shields harbor, near the mouth. The effort to make it a harbor fit for a rapidly growing traffic has in it some good lessons for us at Chicago.

In 1850, as a result of a general agitation in Britain for the improvement of ports, a parliamentary act transferred the conservancy of the Tyne from the city of Newcastle, where it had long been vested, to "The Tyne Improvement Commission," which was a public trust, though differing in some critical points from the more successful later trusts on the Mersey and the Clyde. Without going into the history of it, the trust in its present form consists of 32 members, derived as follows:

Two life members selected by the Board of Trade of Newcastle.

Fifteen members elected annually from the various municipal corporations on the Tyne, as follows:

- 6 from Newcastle.
- 2 from Gateshead.
- 3 from Tynemouth.
- 3 from South Shields.
- 1 from Jarrow.

Fifteen members, elected tri-ennially as Dues Payers' representatives:

- 5 by the Coal Owners.
- 5 by Ship Owners.
- 5 by Traders.

This on the face of it gives the balance of power to business interests directly involved in the harbor, rather than to the more general municipal interests of the towns. But there are further conditions which put it peculiarly into the hands of the business interests, for it will be observed the representatives of the towns are elected annually, and hence are subject to rather rapid change,

while those representing business interests direct hold office for three years. But there is a further very curious advantage given to the business interests in the privilege of plural voting. In the requisites for dues payers' electors, it is provided that every coal owner shipping coal, coke or cinders during the preceding year, in respect of which Tyne dues have been paid, shall have one vote for the first 10,000 tons, and one vote for each additional 25,000 tons up to a maximum of 18 votes. Every registered ship owner has one vote for the first 100 net register tons upon which dues were paid during the year, and one vote for each additional 250 tons up to a maximum of 18 votes. In a similar fashion, traders are allowed votes up to a total of 18. At an election of members to the commission, an elector may vote for as many candidates as are necessary to fill vacancies, casting all his votes or any part of them for any candidate he pleases.

It will be seen that by this process members are chosen by *business* rather than by business men, and that it would be a very simple matter for large interests to override the many small interests in the choice of representatives, and in the policies of the commission.

The Tyne Improvement Commission has jurisdiction over the river from the piers at the mouth to a point inland $19\frac{1}{2}$ miles, or about 9 miles up beyond Newcastle. But, unfortunately for the commission, it has not a monopoly of the business of the port, as is the case on the Mersey and at Manchester. In fact, their interest in docks and wharves is a minor fraction of the total facilities of the river. The North Eastern Railway alone has port facilities greater than the entire equipment of the commission. This divided interest in the river has been an extremely hard matter to handle, and the wonder is that the river has been so well developed. The Tyne is a crooked river, winding between high banks, and it has had to be straightened and dug out bodily at very great cost. This expense has fallen entirely on the commission, without help from city or nation, though the benefit has accrued to all the private docks and other properties along the river. Since 1850 about \$85,000,000 has been spent on the harbor, and this almost wholly in making and maintaining a channel, very little for docks or other construction.

The gross receipts for 1907 were £437,254, or about \$2,000,000, derived largely from dues of one kind or another; river tonnage, ballast dues, bridge dues, coal and coke export dues, harbor lights, buoys and beacon dues, mooring dues, Tyne pier's dues, etc. The net register tonnage of all vessels, coasting and oversea, cleared outwards in 1904 from the Tyne ports was 8,641,341, which places

the river fourth in the list of British ports. The population of the Tyneside towns has risen from about 190,000 in 1851 to 600,000 in 1901, and the whole region is growing rapidly, new industries springing up on every hand.

The river in its size and curves and character of improvement needed reminds us very much of our own local situation. But the expenditure of over \$2,000,000 a year on harbor maintenance, by a population only one-fourth that of Chicago, should be food for thought. They have the bridge problem, too. The old high-level or Stephenson bridge has head room for ships of 83 feet in the clear, and the new King Edward VII. bridge has the same. Close below the Stephenson bridge is a low-level swing bridge. But few large boats go above these bridges, and this one swing bridge is the last bridge toward the sea. There has been clamor for bridges lower down, and the commission has established ferries to serve the wish for crossings. North and South Shields, being beaten in Parliament in an effort to get a bridge near the river mouth, got a permit for a tunnel, but nothing further has been done and it is believed that the time will expire and the permit lapse with nothing done. There is now an agitation on for the municipalities to take over the ferries and the commission is quite willing it should be done.

Another point of interest for Chicago is in the piers at the river mouth, which advance out three-fourths of a mile to sea, compelling the 15-foot tide to keep the bar clear to a 30-foot depth at low water. These sea walls are carried out to the 50-foot depth, are made of great concrete blocks laid in cement, and carry a railway track and 130-ton cranes for use in construction and repairs. The channel in the river provides 30 feet at low water up to Albert Edward dock, and 25 feet up to the swing bridge. There has been a steady decrease in the number of vessels entering the Tyne from 19,663 in 1865 to 12,935 in 1907. But the average size of vessel has grown from 205¾ net register tons in 1865 to 698 1-5 in 1907, and only two vessels in 1907 were over 5,600 net register tons. That is, the entire traffic of the Tyne is carried on in boats of an average capacity comparable to those in service at Chicago, while the large ore boats coming to the Calumet have twice the carrying capacity of the largest vessels in service on the Tyne.

Still another point of great interest to all of us in America is that not only does a community with only one-fourth the population of Chicago spend over \$2,000,000 a year upon its harbor, but its Harbor Commission cares for human life, and the head men are quite as proud of the provisions for safeguarding human life as they

are of their engineering successes. The commission has had the courage also, and far-sighted good sense to make provision for pensioning retired officers and employes, and provide for the families of those sacrificed by accident. And they reap the pleasant benefit from it of a devoted and efficient service by all employes.

The Port of Bristol

The river Severn and its valley provide a highway from the southern apex of the coal-rich English midlands to the Bristol channel at the southwest. The export and import traffic of the very rich region of Birmingham is sought by Bristol, with advantages which may outweigh the claims of Hull or Liverpool and Manchester. Bristol is also a gateway for the Thames basin, and the great market of London. In addition to these reasons is the very great advantage

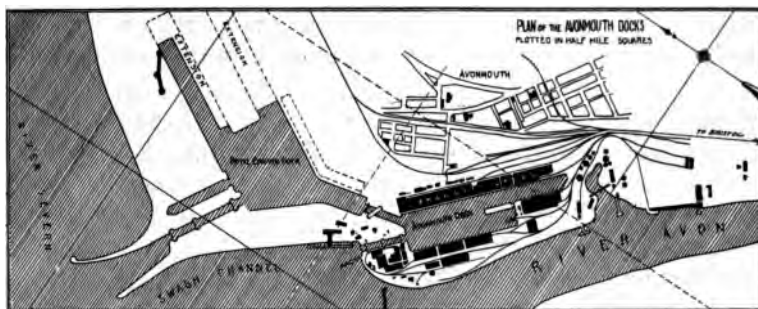


Fig. 9. Plan of the Docks at Avonmouth.

of being on the most direct and shortest route to the great American ports. These articles of advantage are being said over like a creed by the good people of Bristol, and with the courage of their convictions they are making splendid provision for the trade which must and will come.

Bristol for a thousand years has been one of the most famous ports of Britain. It was from the wharf at the foot of the main street that John and Sebastian Cabot set sail to discover the new world. During the palmy days of the slave trade Bristol merchants amassed vast fortunes and acquired a practical control of the rich traffic of the West Indies. There are yet today great sugar and cocoa factories which were started in those old days. But the town of Bristol is six and one-half miles up the little river Avon, a river smaller than the Chicago river. And when last century the ships

began to grow large by the introduction of steel and steam, the port of Bristol did not make provision for the larger craft, and her trade dwindled. With a river so small and a tide so high—there is a tidal range of 40 feet in the Avon—it was out of the question to dig the river deep enough to bring the great ships up to Bristol. A private company in the seventies built docks at the mouth of the Avon, and the city recently in self-defense got a new Act from Parliament to extend their powers, bought up the docks at Avonmouth and began to plan for facilities adequate for the largest vessels on the ocean.

It is worth noticing that it is the city government that has been the actor in the case of Bristol. The port is handled as a municipal monopoly—the best case in the kingdom, though there are in Britain twenty-one other cases of municipal monopoly, and sixty-seven cases in which city control is shared with state or private interest. At Bristol the ownership of all docks, quays, sheds, warehouses and other property is vested in the Lord Mayor, Aldermen and Burgesses of the city of Bristol, and the management of the estate is vested in a committee of nineteen members of the city council. This committee, with very able assistance of a permanent corps of administrative officers, a secretary and general manager, collector of dues, engineers and assistants, traffic manager and harbor master, carry on the entire business of the port—construction and maintenance, warehousing, and the handling of all sorts of freight on the water or on the quays, and on the railway tracks of the estate.

At the docks in the city of Bristol much of the quay frontage and shed room is rented out on leases, some for 999 years, as in the case of the Co-operative Wholesale Company. At Avonmouth, however, the purpose is to keep and operate the port facilities as a city business. It is the city that handles the grain and tobacco and meats into warehouses, and who handles the freight cars to and from the quays and the tracks of the great railways outside the dock estate. Since the completion of the newest dock, the Royal Edward, the railway companies pay the city for this switching 3d per ton for goods of Classes A, B and C, and 9d per ton for Classes 1, 2, 3, 4 and 5. The city has on the dock estate 43 miles of railway and ten locomotives.

The quality of construction done by the city is a very valuable object lesson to us. Everything is of the very best and most durable possible. The warehouses are of brick or of ferro-concrete, and are architecturally pleasing. The new tobacco warehouse is of ferro-concrete faced with vitrified brick, 200x100 feet, walls at bottom 3

feet thick, floors and roof supported by posts about 15 feet apart. The building is nine stories high and basement, and it is absolutely fireproof. The two tobacco warehouses hold about 25,000 casks of tobacco. The new grain elevators are similarly built, placed 200 yards from the dock, and served by endless belt conveyors through tunnels, so half a dozen vessels can be loaded or unloaded at once. The new Royal Edward dock just dedicated by the King in July last, is a magnificent structure. It is large enough to accommodate half a dozen great liners at once, but is only the first and outer dock in what is hoped will be a long series of docks running eastward along the foreshore of the Severn estuary. The tidal range of 40 feet requires a dock wall and gate over 80 feet deep, in order to admit the largest ships at any phase of tide. The walls are of concrete, faced with vitrified paving brick and coped with Norwegian granite blocks pointed and keyed with lead. Such construction is planned for a thousand years. There is no finer anywhere. It makes one hang his head for the shabby and shoddy stuff we line our rivers with.

The present population of Bristol is only a third of a million. They have borrowed for harbor improvement since 1848, £4,988,650, or nearly \$25,000,000. Their income from the business of the port in 1906 was \$1,137,067, upon a net register tonnage of 2,112,907, the increase in net tonnage since 1850 being nearly 400 per cent. Upon the above obligations the dock estate has been able to pay 4.16 per cent, but now the city obtains its loans at 3.5 per cent, and the dock estate pays that and lays by a sinking fund as required by statute. In case the expenses are not met by the revenue of the dock estate, the deficit must be made up from the fund raised by general taxation. But very slight call has been made upon the pockets of the citizens so far. In all my tour of a score of the world's great ports I found nowhere more earnest zeal for the development of the port and the city than was in evidence in Bristol. The whole community moves as one man, and at a pace and with an earnestness and wisdom that must succeed. Bristol now has a first-class harbor. Her next great problem lies in enlisting the whole hearted support of the railways in her hinterland. As in the case of Boston and Philadelphia, her problem is one of establishing fair relations with the systems of transportation on her landward side.

The Scottish Lowlands

The lowlands of Scotland have in all periods of history been the wealthiest and most densely populated part of the country. They have a flat surface and rich soil, and they have also almost all of the mineral wealth of the country—a considerable deposit of coal, oil shale and iron—and because of this the bulk of the manufacturing industry. The area is not large, it is only 42 miles from Glasgow to Edinburg. And since the minerals are most largely on the west slope, Glasgow is the metropolis and port.

The Port of Glasgow

It is rather striking to notice that Glasgow, though one of the world's great industrial and commercial cities, is the focus of an area of not much over 25 miles radius. It is the only large city in the region and in its growth and the character of its institutions reflects not only the wealth of natural resources, but also the sterling quality of the population making use of the natural advantages.

In organization and administration of the port we find in Glasgow several of the features familiar at Liverpool and Newcastle. The port was managed for generations (1611-1825) by the magistrates and town council. Various changes were made in the form of organization during the next generation, and in 1858 an act was passed establishing a Port Trust, which has held up to date and which is interesting as combining without the trust idea an intimate and increasing municipal interest. Since the most of the modern port development was done by the trust as organized by the act of 1858, it will be instructive to record the form of organization therein provided. The trust was administered by an incorporated body of twenty-eight trustees, who gave their services gratuitously, consisting of:

The Lord Provost of Glasgow (the Mayor).

Fifteen members representative of the shipping, mercantile and trading interests of Glasgow, viz.:

Two chosen by the Chamber of Commerce.

Two chosen by the Merchant's House.

Two chosen by the Trades House; and

Nine elected by the ship owners and harbor rate payers.*

The Merchant's House and Trades House are associations of guilds handed down from the middle ages, both bodies exercising a

*Handbook of Industries of West Scotland, article on Clyde Navigation, by T. R. Mackenzie, General Manager and Secretary to the Clyde Navigation, Glasgow, 1901.

very powerful influence in the local social and industrial activities. The body as thus incorporated and known as the "Clyde Navigation," has given us the modern port of Glasgow. It has created a harbor out of grain fields and pastures. Where almost within the memory of living men the Clyde could be forded, is now a channel admitting vessels of 28 feet draft. To accomplish this the bed of the river has been lowered between 24 and 28 feet for nearly 20 miles, and this has required a dredging in the last seventy years of over 72,000,000 cubic yards of material. The trust has been always a very efficient business organization. The port is not worked for a profit. The Clyde trustees are the only navigation authority within the port. Their powers include (a) deepening, widening and straightening the river; (b) its lighting and buoing; (c) the construction of docks; (d) the borrowing of money for works, and (e) the levying of rates on all vessels and goods. There has never been any municipal or national guaranty rates or assistance of any kind.

Since the Clyde for 18 miles is either actually or potentially a harbor, towns down below the limits of Glasgow have become interested in harbor facilities, and after much agitation for representation in the trust, an act was passed by Parliament in 1905 raising the number of trustees to 42 to be chosen as follows:

Twenty-four chosen members:

- 10 by the Corporation of Glasgow.
- 2 by the County Council of Lanark.
- 1 by the County Council of Dunbarton.
- 1 by the Town Council of the Burgh of Govan.
- 1 by the Town Council of the Burgh of Partick;
- 1 by the Town Council of the Burgh of Dumbarton.
- 1 by the Town Council of the Burgh of Renfrew.
- 1 by the Town Council of the Burgh of Clydebank.
- 2 by Chamber of Commerce of Glasgow.
- 2 by Merchant's House of Glasgow.
- 2 by Trades House of Glasgow.

Eighteen elected members: Elected by ship owners and harbor rate payers (the electors being those paying £10 of rates in the year preceding the election).

So though the Clyde Navigation is still a trust in form, the manner in which the majority of its members are now chosen makes it a municipal body, though not looking to the municipalities for any financial support. It distinctly lacks the simplicity and independence of the Mersey Docks and Harbour Board. Enterprising public-spirited business men regret the increase in number of trustees. The body becomes too unwieldy. It is too easy for a member to find an excuse to stay away. They feel also that it is a mistake to have

members chosen to represent so many towns and other interests, and that the port suffers from the inertia of such a body; and from the fact that one who represents one of the lesser towns will take notice when the interests of his town are discussed, but lacks interest in the general welfare of the port.

Unlike Liverpool and many other port authorities, the Clyde Navigation does no warehousing, handles no railway cars nor lighters, and its sheds are used only for goods in transit. So its earnings on the same amount of traffic are less than at Liverpool or Manchester. Nevertheless, it earns a very commendable income, and its record is extremely creditable. The following table shows the growth in income since 1860, rising in 1907 to almost \$3,000,000.

The Clyde Navigation Total Revenues, 1860-1908

(From Clyde Navigation Annual Statistics, Year Ended June 30, 1907.)

1860	£ 97,984	1890	£ 356,203
1865	121,588	1895	353,813
1870	164,093	1900	441,420
1875	196,327	1905	513,548
1880	223,709	1907	547,862
1885	291,658	Or about \$2,800,000 in 1907.	

During 1907 the net register tonnage of vessels arriving at and departing from the port was 11,799,613. The tonnage of goods was 9,795,093, or just about the present lake traffic of the port of Chicago. From 1858 to January 30, 1907, the total capital investment in the improvement of the port has been £8,884,261, or in round numbers, \$44,000,000. Bonds have been issued at various rates between 3 and 4 per cent and the trust not only pays the running expenses and this interest on investment, but sets aside a sinking fund as well.

The Clyde Trust faces the bridge problem, though up to date, bridges have been evaded. There are no bridges across the harbor, all of the shipping being accommodated below Glasgow bridge, the lowest bridge on the Clyde. But the trust supplies ferries at various crossings, and "cluthas" or passenger boats ply between ports up and down the river. The charges are very low, on the shorter ferries as low as one cent per passenger; in fact, the charges are based upon the bare cost of operation, there being no intention of making a profit. There are twelve ferries in the upper six miles of the harbor and in addition two subways, one being a part of a subway belt line for passenger service, but not much used.

The port facilities of the Clyde are of the best. The channel now provides 22 feet at low water and 33 feet at high tide. Berth-

THE PORT OF GLASGOW

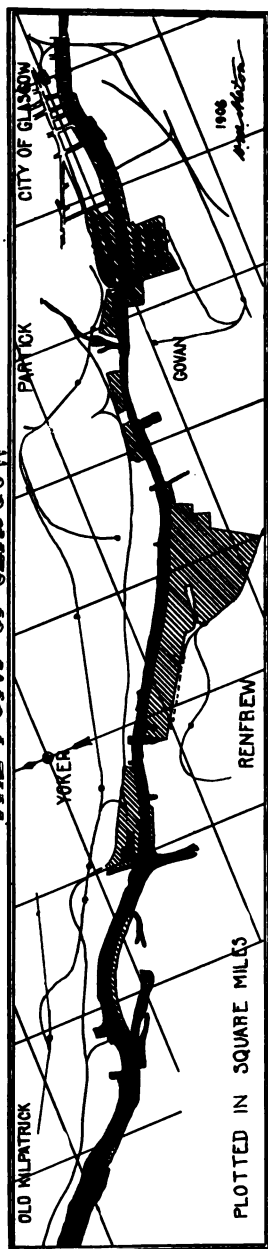


Fig. 10. From Glasgow Bridge to Port Glasgow is 18 miles. The river the entire distance is available as a harbor. This map shows only the upper half of the river channel. The shaded areas are lands owned by the Clyde Navigation for port and commercial development.

age is supplied on either bank of the river, 45 per cent of the total harbor, and in specially constructed docks or tidal basins 55 per cent of the total. The tidal range of eleven feet does not require the construction of expensive gates and locks. The total quay front in Glasgow is about ten miles. About forty ocean-going vessels can be accommodated with berth and sheds at one time. There are over fifty acres of floor space in the sheds. The sheds are modern, one and two stories high. Movable cranes are furnished on the quay, usually one railway track between the shed and the water.

All construction, as in most other British ports, is very substantial, of masonry and concrete mostly, and built for all time.

Inland transportation is almost wholly by rail. Nearly every quay is supplied with tracks, 22 miles in all, owned by the trust, and connecting with the railway systems of the hinterland. The trust has no cars or locomotives, and no charge is made for the use of tracks.

The story of Glasgow has much food for thought for us in Chicago. The development of the port made possible the development of the hinterland, and has invited great industries which otherwise could never have been established. This is notably true of shipbuilding. The coal of the region meets the ore of Spain and limestone of Wales upon the banks of the Clyde, and steel navies for all the world are born. The *Lusitania*, largest of ships, was built and launched upon the Clyde. Many of the boats for our own Great Lakes traffic have come from the yards of the Clyde. The record of tonnage built since 1860 shows us what we might be doing in Chicago:

Tonnage of Ships Built on the Clyde, 1860-1907

(From the Glasgow Herald, December 31, 1907.)

1860..... 47,833	1876.....174,824	1892.....336,414
1861..... 66,801	1877.....169,710	1893.....280,160
1862..... 69,967	1878.....222,353	1894.....340,885
1863.....123,262	1879.....174,750	1895.....360,152
1864.....178,505	1880.....241,114	1896.....420,841
1865.....153,932	1881.....341,022	1897.....340,137
1866.....124,513	1882.....391,934	1898.....466,832
1867.....108,024	1883.....419,664	1899.....491,074
1868.....169,571	1884.....296,854	1900.....486,337
1869.....192,310	1885.....193,453	1901.....511,990
1870.....180,401	1886.....172,440	1902.....516,977
1871.....196,229	1887.....185,362	1903.....446,069
1872.....230,347	1888.....280,037	1904.....417,870
1873.....232,926	1889.....335,201	1905.....539,850
1874.....262,430	1890.....349,995	1906.....598,841
1875.....211,824	1891.....326,475	1907.....619,919

Last year's tonnage built on the Clyde is about 50 per cent greater than the total tonnage built in American yards in the same year, and is about two-thirds as great as all the shipbuilding in the world outside of Britain.

In many other lines of industry, as in textiles, a great growth has been possible because of the development of the port. "The extraordinary increase of population and industries adjacent to the harbor and river is a proof of progress. Our city population has doubled since 1863. Partick has grown from 12,000 to 65,000; Govan from 9,000 to 90,000; Renfrew from 4,000 to 11,000; and Clydebank has developed from green fields and ploughed lands to a town of 40,000 inhabitants." The population of the Greater Glasgow is now about 1,000,000, and as prosperous and industrious and alert and aggressive as any we can show in America; but with a vastly greater interest in the welfare of the average individual, and with a more conscious community interest in the solution of social problems of all kinds than can be found anywhere in America or than can be hoped for in the next generation.

The London Basin

The rich farming lands of the south of England, especially those of the Thames basin, in the early centuries gave rise to the greatest population density and wealth in England, and the Thames estuary opening out toward the continent, fixed at London, as the head of navigation, the metropolis and most important port of the realm. When the Dutch supremacy on the sea was shattered in the seventeenth century, the importance of the British merchant marine and of the port of London rose at once to the first rank, an eminence still held, and only within a decade or so threatened by the rise of other nations and centers.

The Port of London

London has always been a great entrepot, importing from all the earth the widest variety of goods, making the world's largest market from which by re-shipment world-wide markets of lesser rank have been supplied. A market thus established has the greatest tenacity, an inertia extremely hard for other rising ports to overcome. So it comes about that London now is the world's headquarters for wool, ivory, spices, rubber, tea, diamonds and various other articles of commerce. But in spite of market inertia, various

commodity headquarters, once in London, have been won to other ports. Liverpool now has grain, meats and tobacco, and New York and Havre take turns as headquarters for coffee. And it is inevitable that other markets will in time be lost, for London is not holding her own. The population of London, now about 7,000,000, increases with a rate and uniformity hardly equaled in any other metropolis, but the rate of growth of the commerce of the port is exceeded by New York, Antwerp and Hamburg. London today in net register tonnage stands below these three ports.

The far-sighted, public-spirited men of the port of London have watched this slowing up in the business of the port for the last decade. They realized that the condition is largely due to the method, or lack of method, of port administration. For London, like most of our American ports, is like Topsy in "Uncle Tom's Cabin," who "jest grewed." As a consequence the administration of the port of London is the most complicated on record. Quoting from *The Port of London; Minutes of Evidence 3343-4*: "The chief authorities are:

"The Thames Conservancy: for the conservancy of the whole of the Thames, including the port, the area of its jurisdiction in the port differing in limits for various purposes;

"The Trinity House of Deptford Strond: for pilotage, lighting and buoys from London Bridge seawards;

"The City Corporation: for port sanitary purposes from Teddington lock seawards;

"The Watermen's and Lightermen's Company: in the business of lighterage and barge service;

"And many other authorities with statutory powers, which have to be taken into account, such as the dock companies and other companies, and several local authorities."

The Thames Conservancy is a governmental board with varied powers, extending over the entire Thames basin; "channel maintenance, regulation of navigation, supervision of all explosives and petroleum, the maintenance of all public moorings, the use of which are free to ships; the marking, watching and removal of wrecks and obstructions from the channel, the dredging of the river for the improvement and maintenance of navigation, the prevention of pollution." The Trinity House is likewise a government board, responsible for the lighting of coasts and harbors not locally provided for; it licenses and regulates pilots, examines all persons who

are qualifying for position of dock master, masters and mates of vessels. The Watermen's and Lightermen's Company is a vigorous specimen of the mediaeval gild, controlling the character of service, charges and personnel of the barge and lighter business of the port. The Corporation of London is at once the sanitary, police and fire authority of the port. It safeguards the port from entrance by way of the river of infection and disease brought in either by persons or goods."

In 1901-2 a Royal Commission made an exhaustive study of the Port of London, the result of which was the introduction of a bill into Parliament to unify and simplify the port administration. The need was urgent, but the problem of compromise or settlement with the multitude of conflicting interests in the port was too great, and the bill was defeated.

Another bill was introduced in the summer session of 1908, which has run the gauntlet of all the multitude of opposing interests and which in the closing days of the autumn session became a law. It is instructive to notice that after the deliberate and exhaustive study for a number of years of the port problem, the promoters of this bill have adopted practically the Liverpool plan of a public trust, of absolute freedom and undivided monopoly control over the port. The trust is composed of 24 members as follows:

Fourteen members elected:

By payers of port dues,
Wharfingers,
Owners of river craft.

Ten members appointed:

One by the Admiralty,
Two by the Board of Trade,
Three by the London County Council (members of),
Three by the London County Council (not members of),
One by the Corporation of London,
One by Trinity House.

This port authority is to elect its chairman and vice-chairman, who may, but need not be, members of the trust. The trust may pay the chairman, vice-chairman and chairman of committees any salaries it sees fit. The trust is given power to do the business of any dock company, and to construct and equip docks, piers, quays, sleds, warehouses, railways, etc., and all present dock companies' holdings are to be transferred to it. The trust may, on application to the

Board of Trade, be given power to acquire land for extension by purchase or otherwise than by agreement; to construct and equip and to charge to capital any such improvement. The values of all properties to be turned over to the trust have been appraised by competent disinterested parties and terms arbitrated where necessary. The result of this valuation is somewhat surprising. The nominal value of all docks is given as £24,000,000, and of the 320 wharves as £13,000,000, a total of docks and wharves of about \$200,000,000.

It is most significant for us in Chicago that the best brains in Britain, after years of exhaustive study, have adopted the policy of having one powerful independent monopoly in charge of the business of the port. Private interests disappear, and the affairs of the port are to be managed as one estate in the interest of all the people doing business in the port; and with the intention not of paying the largest dividend possible, but of giving the best possible service, and paying an interest of only about 3 per cent on the actual capital investment.

The London port facilities are very extensive. The Thames is a harbor of rather excellent quality from London Bridge to Tilbury docks, a distance of $22\frac{3}{4}$ miles. At low water there is a channel at Tilbury 26 feet deep, falling to 14 feet at London Bridge. High tide adds 21 feet to these depths. In spite of this range in tide levels, there are 80,000 feet of quay in use on the river banks, and half the discharging of cargo of the port is done either at the riverside quays or in the open river. To serve this river traffic 62 tiers of water moorings provide berths for 121 ships, used by vessels up to 5,500 net register tons, and in addition there are 16 swinging moorings each for one vessel. Three thousand vessels per year use water moorings, and pay no port dues except the slight fee to the Thames Conservancy.

Vessels anchoring in the river or at any quay may be served by barge or lighter. These barges flock round a great steamer and take its cargo for delivery to any warehouse or quay on the whole water front of London harbor. There are over 10,000 of these barges in commission, ranging in size from 70 to 200 tons. They are small enough so they can go under the bridges and into the canals, and so they serve the upper river. The barge is the most characteristic feature of London harbor traffic. These barges are owned privately and pay no port charges whatever. Each barge is licensed by the Watermen's Company, and a small annual renewal of from \$1.50 to \$2.50 per year is charged on each owner's fleet. The river is lined

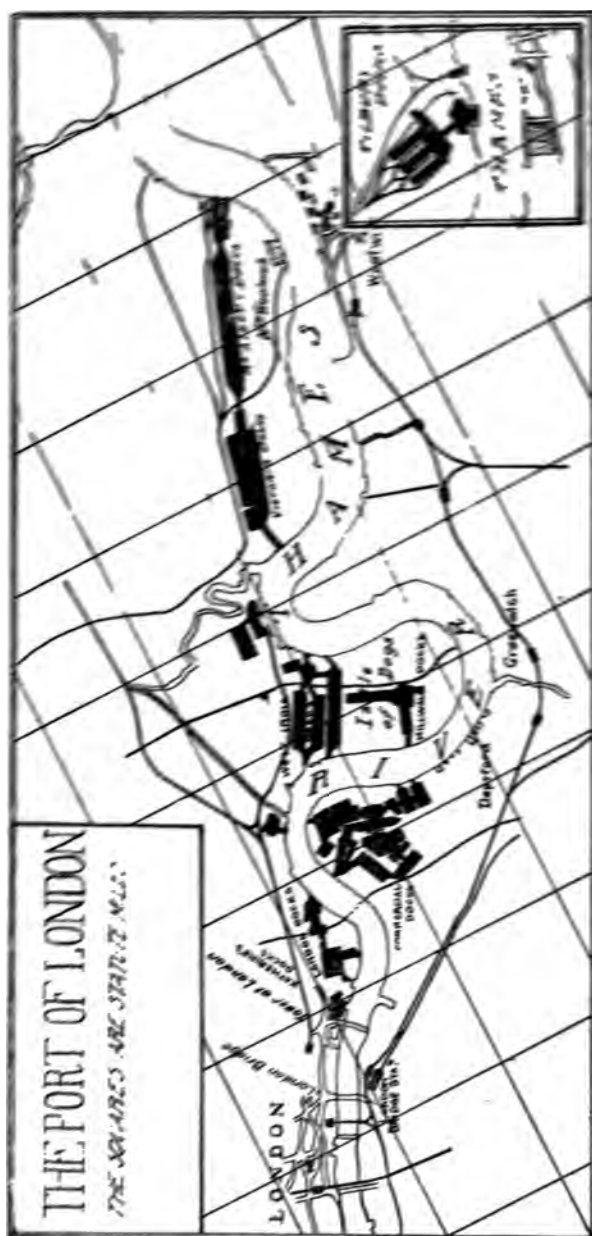


Fig. 11. It is 22 miles from London Bridge to the deep water at Tilbury Docks. All the river is available for harbor purposes, but only the part here shown is much used.

on both banks with warehouses and fringed with these barges at all times. When one has watched these busy lighters, taking goods from any part of the miles of river front to vessels anchored anywhere else, and seen the flock of barges round a steamer in mid-stream, ready to take the boxes, barrels and bales to any one of miles of warehouses anywhere in the port, the possibilities of such service in Chicago harbor between Calumet, the lake front and the river and canal loom large on the imagination, and one cannot escape the conviction that our city cannot do better than to give every consideration possible for the establishment of such facilities here.

About half the traffic of the port is handled in docks and basins, connected with the river by locks so as to maintain a constant level of water and to concentrate the handling of freight into a smaller area. Until the passage of the recent Harbor Act all the docks were owned by private companies, which also furnished the shed and warehouse service, but were not at all interested in shipping. About 80 per cent of the dock business was in the hands of one concern—the London and India Docks Company, owning nearly all the dock facilities north of the river. South of the river the Surrey Commercial Docks Company owned all the docks.

The London and India Docks Company controlled the dock situation in London. It owned 430 of the 640 acres of water in the London docks, and 106,000 feet of the total 143,000 linear feet of quay. The estate covered 1,800 acres, had 15,500,000 square feet of shed and warehouse floor space, capable of caring for nearly 1,000,000 tons of goods at a time. The best accommodations in the port for the largest steamers, the Tilbury docks, $22\frac{3}{4}$ miles below London Bridge, belonged also to this company. On the estate were 80 miles of railway, and the company owned and ran 30 locomotives to handle the freight cars.

On the whole, the docks and riverside quays of London are not well served by railway. The great bulk of freight is handled by barge or lurry. The newer docks, the Royal Victoria, Royal Albert and Tilbury docks, are well equipped with tracks, as a rule two tracks on the quay between the water and the shed, and ample switching yards back of the shed. Though the Thames is connected by canal with the network of canal systems of central England, canal traffic is not a large element in the business of the port. The canals of Britain are in nearly the same state of desuetude as our own canals and for about the same reasons.

One reason why the port traffic of London has not held its own is to be found in the flow of freight from the west, which can come

via Bristol, Southampton and other ports, and arrive many hours sooner by a short rail journey. That is, the London market is more and more being served by outlying ports. American meat, for example, is unloaded at Southampton directly into the delivery wagon, and this loaded wagon is carried on the freight car ready to hitch the horses to in London—so saving one or two handlings and several hours of time. And this is a kind of competition which is inevitable. It is a geographic advantage which Southampton and Bristol ought to reap. Incidentally, it is a case of competition between railways and established water routes, the development at Southampton being due almost entirely to the initiative of the London and Southwestern Railway. In similar case, whatever may be done at Bristol is again a question of the co-operation of the great railway systems between Bristol and London.

Southampton

Southampton is thus rising in prominence in proportion as the port service of London markets is cheaper or more efficient than the trade up the Thames estuary direct. The significance of the port lies almost wholly in the fact of its being a gateway for London. It is very advantageously placed as a port of call for vessels to and from the ports of Northwest Europe. Mails from America are landed here for London and the east of England. So for very good reasons the business of the port is expanding. But its importance is always to be limited by the service it can share with Bristol, Plymouth, Harwich and others as a gateway for London.

The London and Southwestern Railway owns and operates its own docks, quays, sheds, warehouses and railway trackage. As to efficiency of management and quality of facilities offered, there is no question. There is evident here again the very great advantage in a practical monopoly of the business of the port, as is so patent at Liverpool and Manchester, with some obvious additional advantages for the attraction of traffic, such as a fusion of port dues with the through railway rates to London, in such a way as to make the through rate more attractive to the shipper than he might get by dealing with an independent port authority and the railway company individually.

The Welsh Coal Field and Its Port

On the south flank of Wales where the paleozoic strata dip off under the estuary of the Severn, are found the richest coal deposits and the best quality of coal of all Britain; coal superior to most of the West Virginia product and ranking next in quality to our best

anthracite. This coal is in demand as steam coal over all the earth, and it is no exaggeration to say that the Welsh coal is burned in every port under the sun. This coal is the one product in a very limited hinterland, which is responsible for the rise of Cardiff, the largest coal-shipping port in the world, and the place where greatest progress has been made in the business of handling coal.

The Port of Cardiff

The Port of Cardiff is the best case in Britain of an exclusively private development. The entire port and all its business is almost exclusively the work of one corporation, practically of one man, the Marquis of Bute. This man, owning very extensive coal deposits in the hills back of Cardiff, established this port in order to ship his coal. Docks were built and a railway to serve them, and being defeated in Parliament in an attempt to get his own railway line back to his coal lands, his road was made a terminal railway company, the Cardiff Railway Company, of which the Bute Docks Company is a part. Seven different railway systems have lines to the docks and the major part of export coal from South Wales goes from this port, constituting about nine-tenths of the export tonnage. Because of this shipment of coal the port of Cardiff ranks third in Britain on the basis of tonnage, while on the basis of value of imports it ranks seventeenth. But in the one great business of handling coal the efficiency of management is unrivaled. Not only do they handle coal at a faster rate than elsewhere in Britain, but they load it with less waste from breakage than anywhere else on earth. A Cardiff invention called the Lewis-Hunter system is in use. The average carload of coal is 10 tons. The car is picked up bodily by a crane, and its load slides out one end into a square steel box or cage, which holds it easily. This cage is then swung over the coamings and to the bottom of the hold of the vessel. The bottom of the cage is a four-sided cone, supported from the apex by a rod which passes up through the coal to the cable of the crane. The box is lifted away from the bottom, allowing the coal to slide out on all sides, the bottom later being pulled up through the coal. The least possible breakage ensues, the coal trimming itself, and distributing the "small" evenly through the hold.

As at Bristol, the tide has a great range, in this case of 36 feet. So all docks must be provided with locks and gates, enormously expensive, and even then vessels may not come in at low tide. The harbor has a water area of $161\frac{1}{4}$ acres, not counting certain pools for the storage of lumber, and a total quay length of $6\frac{3}{4}$ miles.

The Dock Company has an absolute monopoly of the port, fur-

harbor administration ever devised, instructive to us in America as a condition to be avoided. It is the French plan, and applies to all her harbors equally. The public-spirited men of Havre have watched the increase in the size and demands of modern shipping, and the splendid growth of rival ports, knowing all the while that the fault lies in the French system, which has lodged too much power in the state authority, and that a sensible organization of port authority could put Havre where she rightfully belongs in the front rank of the world's greatest ports. When the Chamber of Commerce of Havre started a strong agitation in 1882 to get an enabling act for adequate harbor facilities to keep pace with the demands of commerce, the effort was rewarded with the desired act in 1895—thirteen years merely to get the act.* Then by the cumbersome method of distributed responsibility and divided authority, it has taken another thirteen years to get as far along as the Mersey Docks and Harbor Board may get in a two hours' session.

And it is not to be wondered at that time is consumed, and plans obsolete before a spade is turned. The proposition for the harbor extension now in construction went from office to office between authorities, and back and forth twenty-five times! If there were no opposition, every one anxious for it and pushing it, this gamut would require eighteen months as a minimum.

Then, too, the situation is all the more deplorable that the city must raise about 78 per cent of the cost of an improvement, though the city interests have no power in choice of plan or method of construction, and in the administration of the finished harbor only fragments of power and these compromised by the state supervision. Here is a world's record for divided authority:

1. Minister of Marine has:
 - (1) The pilot service, and
 - (2) The police for mariners and ships in part.
2. Minister of Public Works:
 - (1) New works under engineers of "Ports et Chaussées,"
 - (2) General policing of the docks, and
 - (3) Equipment and lighting of the docks.
3. Minister of the Interior:
 - (1) Sanitary service, and
 - (2) Policing the quays, and
 - (3) Lighting the quays (city expense).

*"Exploitation et Administration des Ports Maritimes." Rapport présenté (to the Havre Chamber of Commerce) par M. Maurice Taconet, au nom de la commission de l'autonomie des Ports. Havre, 1905.

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round sum of \$17,000,000. In ten years according to present plans, the largest ship on the sea can come to Havre at any stage of tide.

Next to an inert central government, the merchants of Havre have been handicapped by a stubborn, privately owned railway, the Western Railway Company. As in so many other places the natural expansion of the city has been subject to the whim of railway management, remote and not actively interested in the development of the city. For some years the purchase of the railway by the general government has been contemplated, and in this time scarcely a sou has been spent upon it to improve the service or advance the interests of its patrons.

The new work now partly finished, provides an outer harbor of 175 acres with an entrance 656 feet wide, approached by a channel 984 feet wide, and with a minimum depth of 29 feet 6 inches. There are 10 inner basins with a combined water area of 200 acres, and with 40,500 linear feet of quay.

The construction of docks, quays, and sea wall is of the highest order of excellence; cut stone, brick and concrete being the materials used. One of the finest lines of transatlantic vessels, the French Transatlantic Company, has Havre as its home port, and their new terminal where passengers are landed is the finest in existence. The building is two story, the first floor being devoted to freight, the second floor to passenger service. The shed is of steel and concrete. Passengers land under cover, into waiting rooms finished in mahogany and leaded glass, and with every necessary convenience; rest rooms, writing and reading rooms, service rooms, telegraph and telephone; a very inviting place.

The warehousing in this port is carried on by a private monopoly, working under permit and supervision of the city. The newer sheds are of brick and iron, rather frail looking, but well served with traveling cranes along the quay, and with railway tracks front and rear. One gets the impression that most of the goods are handled across the quay by dray, or "le camions," as they call it.

The long neglect of the harbor of Havre reminds us of our own case in Chicago. The plan so successfully carried out of making a magnificent harbor by reclaiming as much as they choose of the shallow estuary off shore, is very significant and instructive in view of our own need and opportunity on the lake front. Havre has now a population of only 130,000. Since 1831 there has been spent upon the harbor over \$42,000,000, three-fourths of which has been raised by the city. The heroic efforts and success of the business men of Havre to win harbor success from a sluggish and indif-

ferent bureaucracy and against the deadening influence of an antagonistic railway monopoly in the hinterland, should give us inspiration for our own harbor problem.

The Valleys of Germany and Their Ports

Germany has a population of 60,000,000, Switzerland of 3,300,000, the Netherlands of 5,500,000, and Belgium of 7,000,000. These people occupy the central part of the northwest slope of Europe, a rich agricultural region, rich also in coal, iron and other minerals, and hence rapidly developing as manufacturing communities. The rivers Schelde, Rhine, Weser and Elbe are the chief natural high-ways of this slope, and the river mouths have thus become the foci of a great and increasing international trade. Three of these centers, Antwerp, Rotterdam and Hamburg have within a generation, become commercial ports of the first rank, and it will well repay us to look with some care into the reasons for this rapid growth.

The Port of Antwerp

Belgium is one of the richest manufacturing regions of the world, the industries growing out of the service of the coal deposits of East Belgium. Through this rich area the river Schelde leads northward to the North Sea, where Antwerp at the head of deep water navigation has become the second port of the world as measured by net register tonnage. A network of canals connects the Schelde with the Seine, Meuse and Rhine, and leads the freight to and from a rather wide hinterland. In addition to this there is excellent railway connection to the coal fields and the Paris basin at the south and to the rich and populous manufacturing region at the Ruhr coal field on the middle Rhine.

The valleys of the Meuse and Rhine lead much more directly to Rotterdam and for this reason Rotterdam is a close and active rival of Antwerp as a gateway of West Germany.

Administration. Antwerp is very fortunate in the organization of port administration and we will discover that much of the recent growth of the rival ports of west Europe is due to the wisdom and singleness of purpose of the port administration. The case of Antwerp is that of municipal monopoly, though a small part of the river front is owned by the state.

The city council of 39 members, presided over by the Burgo-

master (mayor), is the highest authority.* The council chooses from its own number a harbor commission of five members, of which the Burgomaster is the chairman. In this commission there are secretaries of commerce and public works. The state undertakes the policing of the port, lighting and buoing, the ferries, and the collection of dues. To facilitate the smooth running of the port

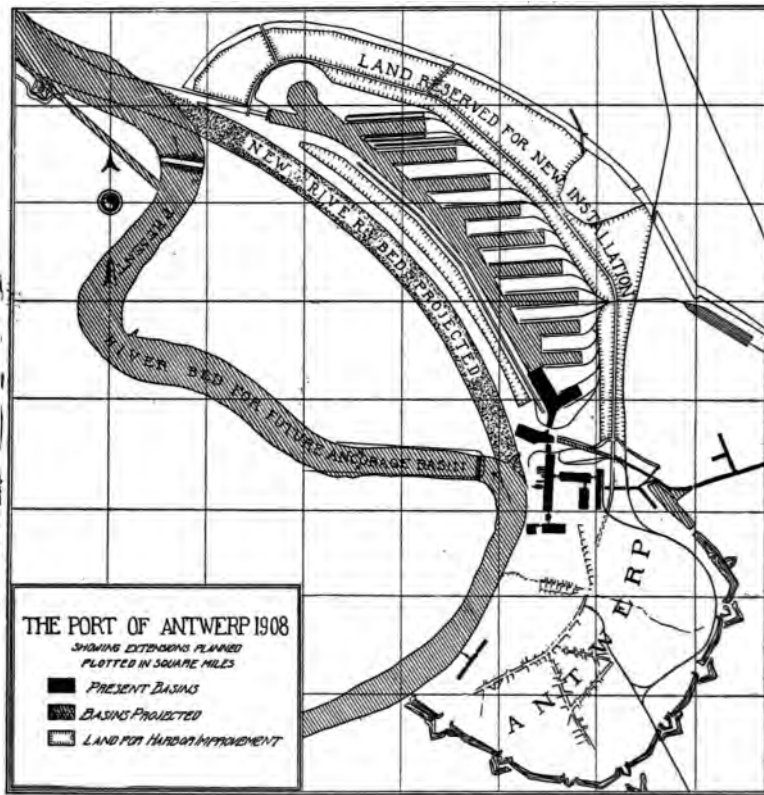


Fig. 13. The Port of Antwerp showing projected improvements.

a special consultative commission is formed, consisting of five state officials, two city officials, and two members representing private interests, as follows:

From the state:

Director of Railways of the Antwerp district,
The Chief of the Railway Freight Terminals,
The Local Engineer-in-Chief of Roads and Railways,

*Notice sur le Port d'Anvers (by M. Ferd. Klnart, Chief Engineer), Brussels, 1905.

The Director of Pilots and Chief of Harbor Police,
The Collector of Customs.

From the city :

The Chief Engineer,
The Harbor Master.

To represent private interests :

Two Members of the Chamber of Commerce.

This consultative committee is an active body with a direct interest in the affairs of the port, and corresponds somewhat to the "Board" at Liverpool.

The port is divided into two very unequal parts, the major portion offering 11 miles of wharfage, was built wholly at the expense of the city. The minor portion of the harbor consists of about $3\frac{1}{2}$ miles of the right bank of the Schelde in the south edge of the town. And though these quays were built by the state, they have been handed over to the harbor authority of the city for administration.

The present municipal monopoly is of recent origin, for Antwerp in 1874 gave a private company the rights of operation in the harbor. The company, however, was incompetent, and the city, in order to make the service of the harbor adequate to the increasing demands of commerce, took over the ownership and operation of all the harbor equipment in 1890, since which time no port on earth has shown a more remarkable development. From fifth rank in 1870 the port has risen to second in all the world in 1906, with 19,662,000 net register tons entered and cleared ; and in the last decade her rate of increase has been most rapid of all.

Port Facilities.—Antwerp illustrates as well as any port that can be named, the fact shown in various lands, that in proportion as good harbor facilities are provided the traffic of the port and country have expanded. "It is an invariable rule that harbor development on modern lines is immediately followed by new shipping and increased trade" (Stephens). Let Chicago take notice.

The total linear wharfage of Antwerp is: Of riverside quays, $3\frac{1}{2}$ miles, which can accommodate about 40 vessels at a time; and of docks, 11 miles, accommodating a very large number of boats of all sizes, from the canal barges and Rhine boats to the largest ocean vessels.

There are on the average about 250 ocean-going vessels in port at a time, and several hundred smaller boats. Nowhere else in



A row of Antwerp Municipal Warehouses, as clean and neat in exterior as a series of Art Galleries.

the score of great ports visited, save at Hamburg, was there evident so much activity in shipping.

There is most excellent service in sheds and cranes. The sheds are about 360x195 feet, and sheds and tracks are arranged so that each shed with its trackage is a unit. The area of floor space in sheds is over 75 acres. Almost all of the sheds are of the one-story type. As a rule they stand well back from the edge of the quay with from one to three railway tracks in front, making it convenient to handle the freight from the rail to the ship direct. The sheds are made of steel with flat tar and gravel roofs, and walls of corrugated steel, which in the latest construction make use of an American invention, rolling up out of the way like a roll-top desk. The sheds along the city front have the roof made into a broad promenade overlooking the river and the shipping, a very pleasant feature, and one much appreciated by the people. The floors of all sheds are of Belgian block, and the drays drive everywhere through them as required.

In the newer installation the three railway tracks and the front of the shed are served by the finest cranes yet devised. These cranes have a single rail of track on the edge of the quay, and rise high above the cars on the three railway tracks and reach across them to the roof of the shed where the other track rail is placed. The railway tracks are arranged so that service at front, middle and rear of the shed can be given without interference with trackage of any other shed. Out-freight accumulates in the shed on the quay side of the middle track, in-freight on the far side from the quay. The handling of freight is most expeditiously done; the service is very efficient.

In warehouses the city is again far ahead of most other ports. The city owns six great buildings of absolutely fireproof construction. Across the street from the main quay and sheds on the river front, four of these buildings stand in an impressive row. They are four stories high, of ferro-concrete, faced with cream-colored repressed brick, and have much architectural merit. They are separated from each other by stone-paved courts of generous width for fire protection. They are really beautiful buildings, and they offer as clean and neat an exterior as a series of art galleries. Railway tracks run on the ground level along the mid-line of the series, to serve them all. Freight elevators serve all floors; the rooms are separated from each other by concrete walls and entrance to any room is by the elevator or by a concrete balcony on the outside of the building. Nowhere else is there such absolute security provided

for goods in storage. These warehouses are rented by the month, the rental varying from two cents per square foot on the ground floor to four mills per square foot on the top floor.

Inland Transportation.—The railways are owned and run by the government in Belgium. The state is equally interested in developing the interior waterways. There are over 1,200 miles of canals in Belgium alone, and these canals join as in one great system with those of Holland, France and Germany. The railways have through service to the great centers in the adjoining countries. All the transportation interests focus upon the harbor and conditions are thus ideal for a development without friction of all the agencies of transportation. It is for this reason that this port shows such phenomenal growth. In 1870 the net register tonnage of ocean vessels entered was 1,100,000, while in 1907 it rose to over 11,000,-

**Table of Tonnage Entered at
Antwerp, 1850-1907**

See Kinart, Page 70

	Tons.
1850	200,000
1860	425,000
1870	1,100,000
1880	2,600,000
1890	4,500,000
1900	6,700,000
1907	11,181,226

000. In 1904 there were 73 different navigation companies doing a regular business in the port. With the expansion of the harbor the interior waterways have had a phenomenal development. In the thirty-four years the tonnage has been multiplied by seven, while the average boat has grown to five times its size in 1870. As a matter of fact, the boats enter with about seven-eighths of a full load on the average, and leave with about four-fifths of a full load.

The railway traffic has had a similar development, though less strongly marked. Less than a million tons were received by rail in 1870 and over four and a half million tons came by rail in 1903. This is an increase of five times in thirty-three years. In 1903 the freight received by rail and boat was: By rail, 2,369,563 tons; by boat on canals and river, 5,529,673 tons. This is a very striking comparison and should be food for thought for us in Chicago. Here is Antwerp, second port in the world, receiving more than twice as

much freight from the interior waterways as is received by rail. Think what we could do in Chicago's hinterland with water transportation, if there were the same emphasis laid upon its development as is given to the railways.

For the traffic of the Rhine a special boat has been developed. It is made of steel, runs to 400 feet in length, to 47 feet in beam, but draws less than 10 feet of water even when its load is 3,500 tons. The largest of these boats do not come to Antwerp, but they are common at Rotterdam and will be more fully described later. The harbor is full of these boats at all times. Some of them have their own power, and draw a train of barges not so supplied. They do a great service as lighters, loading and unloading the great vessels as they lie at the quay. They also do a very great warehouse service, holding the merchant's stock a year or more if necessary, ready to deliver at any time and place desired.

Growth of City and Port.—In the thirty years from 1874 to 1904 the city of Antwerp increased in population from 153,169 to 301,647. That is, the city doubled in population, while its commerce increased between five and seven times. Antwerp is a commercial rather than an industrial town. And the business men of Antwerp are perfectly well aware of their commercial advantage. They have worked as one man to develop their port to its present high standing, and they see the possibilities of an unlimited future development. The old docks built by Napoleon a hundred years ago, stone walls and quays most substantial, are as busy as ever, though because of shallow sills, taking only the lesser vessels. A cluster of newer docks has been added to the northward, all of them closed off by gates from the 15 feet of tide in the river. The construction is of the finest; of concrete, brick or stone faced, coped with granite, the quays paved with granite blocks and brick. And though the capacity of the harbor has been doubled and trebled in the last thirty years, the demand pushes hard on construction. So the city has, after mature consideration, planned a marvelous great harbor extension, which, if carried out in full, will make the harbor of Antwerp the finest in the world. The docks and basins of the harbor are now at the north or down-stream end of the town, where the river bends sharply to the west. There are now nine docks connected by locks clustered around this bend. The ninth and farthest north is the first stage in the new extension (Fig. 13, p. 55). The plan is ultimately to provide a new channel for the river for five miles to the northwest, making a continuation of the broad curve which approaches the city from the

south, and cutting off seven miles of the present river which extends west of the present docks. This will remove two very sharp curves in the channel and will provide a tideless basin six miles long for an anchorage. The great dock system will lie to the northeast of the new channel, and parallel with it, and will consist of a channel 750 feet wide and four and five-eighths miles in length, connecting with the river by a lock at the northwest or down-stream end. Opening off from this channel to the eastward are nine slips 600 feet wide by about 4,000 feet long, to be lined on each side by sheds and railway tracks. There will be three turning basins of 1,300 feet diameter placed about a mile and a half apart, and at the western end a turning basin of about 1,600 feet diameter. Land has been reserved all around this extension for railway trackage and warehousing, and running completely round the docks, and through the reservation a grand boulevard and pleasure drive will be built. The land reserved for this extension is five miles long and $2\frac{1}{2}$ miles at the widest, and has an area of over eight square miles. The first half mile of this new dock system is already in commission, and though not quite finished, it is crowded with ships and barges, serving to its limit even before sheds and tracks can be supplied. It is the plan now to begin construction on the next section, consisting of two slips and a turning basin, just as soon as this first section is completed.

It is estimated that the entire group of new docks will cost \$55,000,000, exclusive of the river diversion, and will give Antwerp a total of 38 miles of quay, and five miles of quiet anchorage in the old bed of the Schelde. The total capital cost of the port to date is \$45,000,000.

The Port of Rotterdam

The logical gateway to the rich Rhine valley is the mouth of the Rhine river and Rotterdam occupies this position of advantage. With the richest part of Europe as a hinterland, this fortunate port is placed quite as favorably for handling the traffic of the world as is London. But between the city and the sea lies nineteen miles of the mud flats of the Meuse distributary of the Rhine, rapidly silting and treacherously shifting in channel. So long as boats drew only 10 feet of water, the passage from Rotterdam to the sea at times of flood tide was made with no great difficulty. But during the nineteenth century boats were increasing rapidly in size, and for lack of channel and harbor facilities the town was being left on one side in the world of commerce. The merchants of Rotterdam worked vigorously to improve the harbor, and succeeded in having the gov-

ernment cut a new and direct channel from Vlaardingen 14 miles to the sea. This channel was finally completed in 1896 at a cost of about \$9,000,000. This New Waterway, as it is called, now gives a free channel of 27 feet at low water up to the quays of Rotterdam.

Administration.—Rotterdam is a very old port, and its history has been a checkered one, but only the latest events are of significance to us at this time. In the middle of last century the need of better harbor facilities was pressing, and charmed with the success of the trust administration in some of the larger ports of Britain, a private company was formed in 1873 and the port given over to its management. But the upbuilding of a great port was too large an undertaking for the private corporation and after sinking nearly \$6,000,000 in the venture, it failed to meet its interest obligations,



Fig. 14. The New Waterway, Rotterdam to the Sea.

and in 1882 its rights were canceled by the city, the entire harbor ownership and management being assumed by the municipality. Then a vigorous, earnest, determined policy of development was inaugurated which has worked wonders. The plan of organization adopted is that of a strict and complete municipal monopoly. The harbor problem is attacked as a matter of common public concern, just as are the questions of water supply, gas, electric light, the care of streets and the like. The harbor affairs are handled as part of the regular city business. The construction is in the hands of the office of Public Works, and the City Engineer's office has the engineering part of it in hand. The collector is a city official. The policing of the harbor is part of the regular work of the city police department. In short, every detail in the construction and conservation of the port is city work, recognized as a most important part of the city

administration. For it is very plainly perceived in Rotterdam that the development of the port is the sole means of giving her merchants an equal chance at the great prize of international traffic.

That this type of port administration has been the best possible for the city and her merchants, there isn't a shadow of doubt, as the record of her phenomenal growth most amply proves.

Port Facilities.—The New Meuse river flows through the town and forms practically one large harbor basin. The current is slight, and the tidal range is only about 4 feet, hence no gates or locks are necessary. The material to be handled is all mud or sand, hence the problems of construction are relatively simple. The case is almost

THE PORT OF ROTTERDAM IN 1908

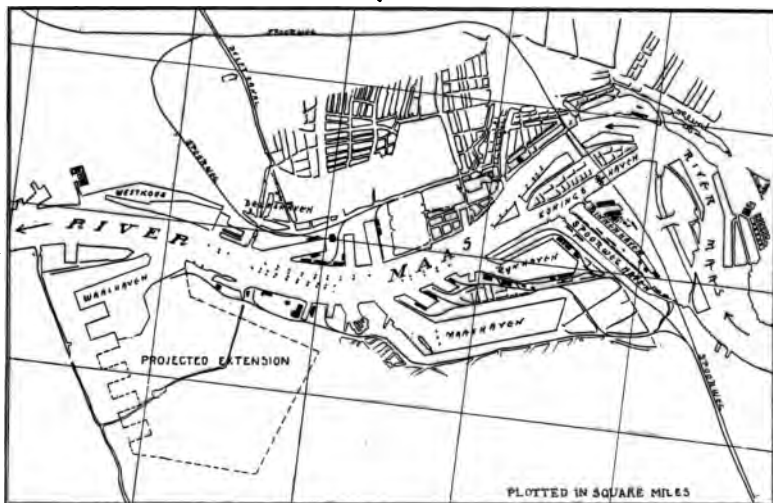


Fig. 15. The Port of Rotterdam showing the Waalhaven Extension.

identical with ours at Chicago. In the river a series of 62 buoys provides for the mooring of 32 sea-going ships at a time. Along the river on either bank are quays and havens, or basins opening off from the river, 57 separate quays and docks in all, having a linear quay extension of 23 miles and a water area of 460 acres. New basins have been added from time to time in the last twenty years, but as in Antwerp, the demand for docks and anchorage presses hard upon the supply. So there is adopted the plan of making a new great basin, the Waalhaven, on the left margin of the Meuse to the southwest of the town toward the sea. This addition will more than double the water area of the port, and the first two slips, or

about one-tenth of the entire area, are already dredged out and in use for the mooring of sea-going vessels.

Sheds are not so much in evidence here as elsewhere, as a great deal of the loading and unloading is done in the open basin, the vessels lying moored at dolphins and flocks of barges and Rhine boats pressing round to serve the freight to or from the ship.

Inland Transportation.—Two systems of railway, one owned, the other controlled by the state, put Rotterdam in close connection with the industrial centers of the hinterland. A belt railway line close round the town connects all the railway tracks and serves all the quays on either bank of the river. This belt line is a city undertaking also. But of far greater importance is the Rhine and its tributaries, and the network of canals all over the Netherlands and reaching on into Belgium, France and Germany. Focusing on Rotterdam as the point of greatest commercial opportunity are 130 lines of steamboats and 360 lines of sailing vessels plying the waters of the interior.

Rotterdam is growing very rapidly as a port of trans-shipment for northwest Europe, sharing in this trade with Antwerp and Hamburg. All three of these ports are taking over this important trade from London; for London is not holding her own in this traffic. The up-Rhine flow of freight is thus largely a matter of trans-shipment at Rotterdam and Antwerp. So it will be instructive to set down here a record of the traffic entered at Rotterdam (see de Jongh: *le Port de Rotterdam*, 7th Edn., p. 26).

**Number of Ocean-going Vessels Entering Rotterdam, and their
Net Register Tonnage. Also Number of Boats Engaged in
Inland Water Traffic, and their Total Capacity in
Cubic Meters, 1850-1907**

Years	Vessels entered.		River and Canal Boats Entered.	
	Number	Net Reg. tons	Number	Total cubic meters
1850	1940	346,180
1860	2449	592,978
1870	2972	1,026,348
1880	3456	1,681,650	63,542	4,008,188
1890	4535	2,918,425	89,969	6,916,442
1900	7268	6,326,901	115,845	15,044,049
1905	8302	8,374,683	132,230	20,801,979
1907	9375	10,197,502	143,242	24,648,711

This record shows the ocean traffic of the port trebled in fifty years, but it shows also the internal water traffic multiplying itself by six in twenty-seven years. This is most illuminating as showing what waterways may do where governments are interested in their development. All rivers and canals in Holland, Germany and France are free to all navigators, no tolls at all being charged except on certain canalized portions of the rivers Meuse and Main. The weight of traffic down the Rhine has increased from 4.6 million tons in 1888 to 16 million tons in 1906. Almost 82 per cent of this traffic is directed to Rotterdam. The increase in this Rhine traffic has given rise to a special type of boat, the Rhine boat, very long, very flat and with a surprisingly shallow draft. The proportions are

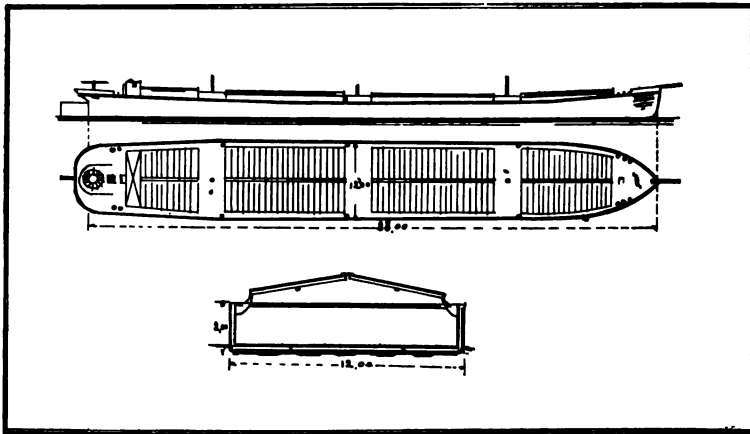


Fig. 17. Plan, elevation and cross-section of Rhineboat. (After Kinart.)

shown in the following illustration (Fig. 16) and in the drawings (Fig. 17), in which drawing, plan elevation and cross section are drawn to scale in meters. These boats are made of steel, the latest and largest ones are over 460 feet long and carry 3,500 tons of goods and over, with a draft of only 9 feet when fully loaded. The Rhine only offers a channel 9 feet 9 inches (3 meters) deep up to Cologne, and 6 feet 6 inches (2 meters) to Mannheim. These Rhine boats go tandem from two to five in a string, drawn by a tug or by one of their number which is supplied with its own power. They are a very familiar sight upon the Rhine. Being very efficient as carriers, their use is growing rapidly.

There is even a service of these Rhine Boats from the river towns to the seacoast towns of Europe. Cologne and Ruhrort have



(Fig. 16.) Rhine boats in the Harbor of Rotterdam.

thus become seaports, doing business with St. Petersburg, Riga, Danzig, Stettin, Kiel, Copenhagen, Hamburg, Bremen, London and several ports in the Mediterranean. This service is of recent establishment, and already handles between 3 per cent and 5 per cent of the total traffic of the Rhine.

The merchants of Chicago should take note. This service is already demonstrated. It should certainly be no more difficult to establish a service of the Rhine boat type on the Mississippi river and make the service to all lake ports, than to do this coasting trade in Europe from the Rhine towns. Chicago may well hope to become a greater focus of this trade than is Rotterdam, for our hinterland is many times richer and our opportunities much greater.

The following table is interesting as showing not only the increase in Rhine traffic in the past fifteen years, but also in showing the great supremacy of Rotterdam:

Growth in Up-Rhine Traffic in Metric Tons

Van Ysselsteyn (1908) p. 171

Year	Amsterdam	Rotterdam	Belgium
1890	170,865	2,582,791	1,165,457
1895	242,315	3,980,127	1,571,765
1900	446,837	7,845,544	2,604,632
1905	478,920	12,771,307	4,435,580
1907	597,518	14,762,226	4,937,737

In all the statistics so far given, no record has been made of the small canal craft, market boats, lighters and the like. About 123,500 such small craft enter the harbor yearly, and they represented in 1907 a carrying capacity of about 25,000,000 cubic meters. As in Antwerp and Hamburg, there is an extensive use made of all these barges and Rhine boats as warehouses. No harbor dues whatever are charged the small boats, only a sort of annual registration fee is collected. So they are cheap and advantageous as warehouses. The small boats a generation ago were largely drawn by horses. Now the horse has practically disappeared and there is a large and growing use of petroleum motors for the propulsion of these small craft, and the waterways of Holland are dotted with them.

The relation of total tonnage of river craft and barges to sea-

going vessels is as 10 to 11, or 10 to 12, a ratio that holds rather constant with the growth of the port. The growth of railway traffic is not so marked. For railway carriage is not used at all for the cheaper and bulkier commodities, except when low water in the upper Rhine causes very high freights on water. The following table shows the increase in railway tonnage for a period of years:

Increase in Railway Traffic at Rotterdam

See Van Ysselsteyn (1908) p. 173

Year	Goods sent	Goods Received	Total Tons
1895	799,110 tons	703,429	1,502,559
1900	812,392 "	962,319	1,774,711
1905	626,767 "	1,440,763	2,067,530
1906	674,275 "	1,355,718	2,029,993

By comparing the two tables one sees that the total railway traffic of 2,029,993 tons in 1906 is only about *one-sixth* of the goods carried by the canal and river boats.

The Growth of the City.—Though the city of Rotterdam is a very old one, receiving the rights of a city in 1340, it was never a large city until a modern harbor was provided, giving its merchants an opening in international trade. In 1850 the city had only 90,000 inhabitants. This had grown in 1900 to 320,000, and now in 1908 it has over 400,000, or about 7 per cent of the entire population of Holland. This rapid growth is plainly recognized by all as being due to the development of the port.

It would be hard to find a city so small as Rotterdam which has undertaken so large a scheme of development with such signal success. The vigor of the people and the faith in the future have made the ventures step by step, resulting in one of the world's greatest ports. From 1870 to 1908 the city has spent in harbor construction and equipment the sum of \$30,827,062. This sum includes the city's 10 per cent share of the cost of making the New Waterway to the sea, and also includes what has been paid for bridges and for real estate condemned for harbor extension, some part of which is re-sold at a large profit. Subtracting such investments, the capital cost of the harbor since 1870 is probably not far from \$20,000,000. This

has been spent by the city alone. Not a dollar has been contributed by the general government.

On the various services the city renders in the port a generous income is realized, as the latest reports show. Van Ysselsteyn gives the income the city receives directly from the harbor activities for the year ending July 1, 1908, as 2,989,850 florins, or \$1,195,940. Thus as a pure business proposition, the municipality is earning about 5 per cent on its capital investment.

The Port of Hamburg

The strictly German ports of Bremen and Hamburg show us much the same development as Rotterdam. And since they are so nearly alike, a special study of one of them will suffice, and for our purpose the best lesson will be found in the case of the larger city of Hamburg.

The Hinterland.—The basin of the Elbe river is primarily the hinterland of Hamburg, and this is a considerable valley reaching nearly 400 miles to the southeast, across the German plain through a notch in the Erzgebirge, draining the basin of Bohemia and carrying water transportation to far Budweis in Austria. But a network of canals connects it across the northern plain with the navigable rivers Havel, Oder, Vistula, Prezel and Niemen, to Memel, the most northeasterly town in the Empire, and to Ratibor in the far southeastern corner of Silesia.

This is an extremely rich area, and there is a large movement of grain from Russia and Austro-Hungary to the west, and of sugar and salt from the farms and mines of Germany. And to the eastward from the Atlantic go great quantities of lumber, grain, fertilizers and the like. So the Elbe is a very busy river, and to the network of waterways is added a number of great railways focusing on Hamburg, giving a large invitation to Hamburg to become a great commercial metropolis.

But there are serious natural handicaps against the town. For its location on the muddy silting Elbe, 63 miles from the North Sea, has required endless labor and skill, and the expenditure of a mint of money in order to provide harbor advantages for ocean-going craft. So what Hamburg has done is really a record of the energy and wisdom of her business men, and the character of her port organization and administration.

Administration.—Hamburg is a free state and, like Bremen, is

proud of being still one of the Hansa towns, which in the middle ages established their independence from the robber barons, and became the guardians and promoters of commerce and all the arts in northwest Europe. It is a just and worthy pride; for to have maintained persistently for seven centuries a stable and very efficient government, guaranteeing the security of commerce and the rights of the merchant and his goods, is no small service. It is a credit that no great nation can lay claim to.

But in common with many other ports of Europe, the rise of the steel steamship in the middle of the nineteenth century made demands upon her port which were not met. The heavy handicap of 63 miles of muddy estuary held her back, and the favors of international trade went to other ports more favorably located or more vigorous in meeting the new harbor requirements.

About the middle of the century direct steamship service was established with America and then began a long list of improvements, which have resulted in making Hamburg a strong competitor for the head of the list of world harbors.

In Germany it is a settled governmental policy to leave harbor development and administration to the individual states. In the case of Hamburg and Bremen the state is coincident with the city, and so the harbor interests are in the hands of the people of the port.

In Hamburg the Senate is the ultimate authority, but that is about the same as saying for Chicago that it is in the hands of the city council. So in Hamburg and Bremen the administration is to all intents and purposes a municipal monopoly. The work of construction, care and maintenance is distributed among the departments of the city-state government. The funds, whether for new work or maintenance, are raised by the city, just as are moneys for any purpose, by bond issues or by taxation. Harbor receipts of all kinds are covered into the city treasury, and though the intention is to make the harbor work pay its way as nearly as possible, no attempt is made to make harbor income and outgo exactly balance. When I asked a high official in Hamburg how great a burden the large expense of harbor development had put upon the taxpayers, he replied with some warmth that it had put no burden at all upon them, "Gar nichts!"—an answer given with the evident conviction that the harbor income pays wholly for harbor improvement and harbor maintenance. This is extremely creditable if true, for there has been enormous outlay and practically every bit of the facilities for present ocean commerce has been provided within this generation.

A very strong feature in the administration of Hamburg is that of the free harbor. An inner area covering about seven-eighths of the harbor area of the city, but doing nearly all the harbor business, is treated as a separate country in the matter of tariff. Goods coming into it or going out of it pay no tariff. On land this area is cut off from the rest of the city by high walls or barriers, and every entrance and exit is guarded. Goods pass into Germany through the hands of customs officials and the customs laws of Germany apply. But goods from this free harbor may go out by sea to all the earth unhindered. So the raw materials come in free to factories maintained within the walls, and the finished product goes out by sea unhampered by tariff imposition. Goods may be stored in the warehouses any length of time, and reshipped without the payment of a duty. If shipped to any point in Germany, the duty is paid only at the time of delivery from the free harbor. The privilege of storing whole cargoes duty free, from which small orders may be delivered at any time to suit the customer, has been of inestimable advantage to the merchants of Hamburg. In this free harbor ships may be repaired, using duty free material and home labor. As a consequence, Hamburg has the greatest advantage of all the ports of Europe in the trans-shipment business.

Because of these great advantages a very extensive warehouse business is done in the free harbor. The city-state supplies the land and leases it to a warehouse company called the *Frei Hafen Lagerungs Gesellschaft*, a private stock company which works under conditions fixed by the city. The city specifies the kind of building and regulates the charges and operations of the company rather narrowly. The company is very old and very respectable, a sort of aristocracy among the merchants.

Large factories are being established in the free harbor. Two of the largest shipbuilding plants in Germany are within the pale.

The manifest success of this free harbor in Hamburg merits study by us in America. It ought to prove quite as profitable for us here at Chicago as for Hamburg, and it should be an advantage so great to our merchants as to put them in control of the markets of half the continent.

Port Facilities.—The tide at Hamburg has a range of only $6\frac{1}{2}$ feet. Hence no locks or gates are necessary and costs and problems of construction are relatively simple. The river from Cuxhaven at the mouth has a navigable width of 650 feet, and a depth of 26 feet at low tide, though there is a bar at one place with only $16\frac{1}{2}$

feet at low water. So all the larger boats must wait for high water to go up to Hamburg, and the great Atlantic liners of the Hamburg-American line have to lighter part of their cargo at Cuxhaven.

The harbor of Hamburg consists of the open river and many basins alongside, extending for five miles through the heart of the town. These basins offer room for 450 sea-going vessels at a time. They have a total water area of 332 acres and there are basins for river craft with 132 acres more. A network of canals and the canalized Alster river, which joins the Elbe in the town, gives 485 acres more of water available for small craft. And, as in the other growing ports still more room is needed for the increasing commerce, new

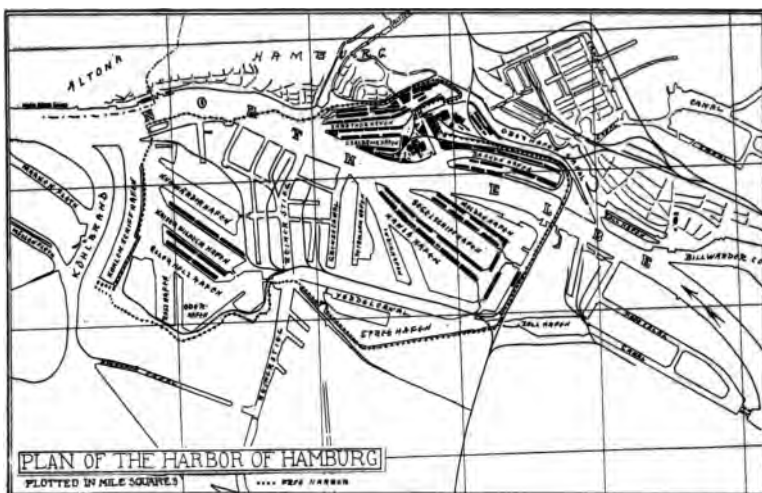


Fig. 18. The Harbor of Hamburg.

basins are being added in the southwest or down-stream edge of the town. This makes the total water area of the Hamburg harbor 1,282 acres, which gives a linear quayage for sea-going vessels of over fifteen miles, and riverside accommodation brings this up to nineteen miles. In addition to this there are twenty-one miles of riverside and canal accommodation for river craft. The basins are made broad and spacious and mooring posts or dolphins are provided in great number, each dolphin consisting of a score or more of wooden piles driven into the bottom and chained together into one large post. Ships tying up at these dolphins pay no wharf dues. It is estimated that 62 per cent of all the freight in the harbor is handled between the ship and the barge direct, and about 38 per cent over

the quays between cars and ship. Next to nothing is handled to or from the ship by dray. These basin mooring places are quite as busy as the quays. Thus the berth accommodation of the port is doubled.

The sheds are of one story, almost all of very cheap construction, most of them of wood with corrugated iron sides. They are about 160 feet wide and from 360 to 1,300 feet long. These sheds have a total area of about 91 acres. Most of them are set back two or three railway tracks from the edge of the quay, and the newer ones have driveways for teams at rear. The older ones stand flush upon the water's edge, because so much of the loading and unloading is done by lighters, but even these sheds have ample railway tracks at the rear.

The warehouses of the port are a very different matter. They are almost universally of brick and those within the free harbor are from 6 to 12 stories high, standing in the edge of the water, to be served directly from the ship or barge. But most of the 106 acres of warehouses are distributed along the canals and basins all over the city, being served mostly by the harbor barges. These barges are everywhere and always busy. There are 4,000 of them devoted entirely to harbor service, and not going out of the city. As in other German ports, these barges serve extensively for warehousing. As many as 800 of them at a time may be in this service, and since no harbor dues or fees are assessed on them, they may lie at anchor for years at no expense, making an additional incentive to their use for warehousing.

The striking thing about the warehouses is their architectural beauty. The end of a row of warehouses is considered an architectural opportunity. It is finished with towers and spires and finials, as fine as high-class residences. At the upper end of Brookfleth canal the chapel of St. Ann some years ago had to give way for the extension of the warehouses. But the warehouse is finished at St. Ann's platz as nicely as a church and even the statue of St. Ann from the old church was given a niche in the end of the building commanding the square.

This thoughtfulness on the part of the city to have buildings and premises beautiful if possible, but neat and clean in any case, is very striking in contrast to our usual American condition. My gentlemanly guide, the Harbor Master, expressed the cultured German attitude as we passed St. Ann's platz. "We believe," he said, pointing to the building, "it is worth while to have things beautiful even in the everyday working places of men!" And that it is worth

while every one will testify who has been in Hamburg, for the harbor with its warehouses and ships is the most attractive part of a very interesting city.

Inland Transportation.—As in Rotterdam, the inland waterways are the principal feeders in the commerce of Hamburg. There are 7,500 miles of navigable rivers and canals in Germany, and these waterways are absolutely free to all exactly the same as our common roads, and for the same reason. Because of this the traffic on the waterways is wholly in private hands, and with a multitude of private owners of craft engaged in the business of transportation. As a result of this free highway the bulky goods of Germany move wherever possible by water. The railways carry goods of less bulk and more value.

In the magnificent annual report of commerce issued by the city, "Hamburg's Handel and Schiffahrt," the commerce is recorded in great detail, as traffic by rail and by water, in and out of the city, weight and value by articles. Some of these data make very interesting reading. For example, in 1906 the total weight and value of goods carried was: (See Hamburg's Handel und Schiffahrt, 1906, II., p. 18-19 and II., 11-13.) From the hinterland to Hamburg: By rail, 32,884,097 doppelzentners, valued at 1,486,553,220 M.; by water, 35,677,964 doppelzentners, valued at 624,512,830 M. To the hinterland: By rail, 17,635,889 dz., valued at 1,147,332,680 marks; by water, 50,079,383 dz., valued at 986,729,660 marks.

That is, the tonnage down the Elbe valley by water and by rail is about the same, but the value of the goods carried by rail about double that carried by water. But in the traffic up the valley the water carriage is about three times the weight of the railway traffic, with a value less than half that carried by rail. The character of the goods carried by water in 1906 up and down the Elbe is shown in the following table (Op. cit. I, pp. 80-81):

UP THE ELBE.		DOWN THE ELBE.	
	Per cent.		Per cent.
Coal and coke	22.61	Fire wood	4.45
Iron	5.64	Salt	18.87
Saltpetre	4.12	Sugar	33.07
Guano	18.07	Wares of stone, zinc, etc.....	24.16
Grain	22.37	Grain	1.97
Package freight	27.19	Package freight	17.43
<hr/>		<hr/>	
Total	100.00	Total	100.00

That so much of the traffic of the country is done by water is not surprising when we learn how freight rates compare between rail and water. From Hamburg to Berlin is 158 miles. It costs 1.38 marks to send 100 kilos (220 pounds) of grain this distance by rail, and but .3 marks by water, or about five times as much by rail as by water. On general merchandise by rail the rate is 2.96 M. per 100 kilos, and by water .45 M., or about six times as much by rail as by boat. Coal, ore and lumber do not go up these valleys by rail at all, the rate by water being comparable to that of grain.

From Hamburg to Dresden is 250 miles in a direct line. On grain the rate by rail is 2.2 marks per 100 kilos, by water .37 marks, or about seven times as high by rail. On general merchandise the water rate is .4 mark per 100 kilos, the rail rate is 4.38 marks, or almost eleven times as much by rail as by water.

One other case will be instructive. There is a considerable traffic by boat between Hamburg and Cologne. The direct distance is about the same as to Dresden, but boats must go a long round-about way down the coast and up the Rhine. The rate on grain from Hamburg to Cologne by rail is 2.04 marks per 100 kilos, by boat .75 mark, or about three times as much by rail as by boat. On general merchandise the rate by water is 1.40 marks per 100 kilos, by rail 4.14 marks, or about three times as high by rail as by boat.

It is most illuminating to see that in a country where the government owns or controls the railways, and fixes the rates itself, that a system of free highways in rivers and canals should handle so large a fraction of the traffic of the country at rates relatively so low. It is plain to see that on our great rivers and between them and the great lakes a water-carrying power equal to the railways which parallel these waterways is lying fallow and undeveloped. And that if we should make water highways adequate and insist upon fair play between rail and water that Chicago has a most splendid situation with reference to the focusing of commercial interests in our great central plain.

Growth of Port and City.—In 1866 there was next to nothing in the way of harbor equipment in Hamburg. Ships anchored in the river and unloaded into barges, or swung to at the wharf and unloaded on the open quay. Since the awakening in 1866 the growth of port and city has been phenomenal. The net register tonnage has risen from 2,857,481 tons entered in 1880 to 12,731,749 tons entered in 1907. It is estimated that the total expenditure from 1880 to date on the harbor alone, including the auxiliary harbor at Cuxhaven,

is about \$100,000,000. This does not count the cost of warehouses or equipment, nor does it count any expenditure for channel improvement. The German government takes care of the channel.

And even with this enormous expenditure, the demands of shipping press close on the harbor capacity and extensions are again under consideration. Hamburg in 1907 is doubtless the leading port in tonnage in all the world.

II. Chicago's Commercial Opportunity

- 1. The Strategic Position**
- 2. The Hinterland**
- 3. How Chicago Became a Metropolis**
- 4. The Manifest Destiny**
- 5. Planning for the Future**

II. Chicago's Commercial Opportunity

One of the remarkable phenomena of the nineteenth century was the magical rise of Chicago. From a struggling village sunk in the mud of a prairie creek it rose within the memory of living men to a great metropolis, ranking fifth in the roll of the world's great cities.

It was inevitable that Chicago should assume this rank, for Chicago is a city of destiny. The record of the past lies open, and he who will may run the gamut of the causes which have worked together in the production of the present metropolis. And if this be wisely done, we shall be in a position to evaluate the resources and forces geographic and economic which condition our future growth. And so we can plan sanely for a long future and for a greater city than has yet been.

1. The Strategic Position

Chicago has developed in an era of dominant East-West traffic. For the traffic of America up to date has been most largely a sending of raw materials to the old and densely populated lands of western Europe, and receiving back the manufactured articles which such peoples produce. Few people realize what a large fraction of the world's commerce it is, which goes on across the North Atlantic. In the accompanying map (Fig. 19) the world's ocean commerce is graphically represented by the shaded bands across the seas between the various ports. The broader the band the greater the flow of traffic. One can see at a glance that the great bulk of the ocean trade goes on between the ports of Northwest Europe and our Atlantic ports at the northeast. The only other flow of trade comparable is that from the same European ports to the Orient and to the Tropics. The trade of the Pacific-Indian ocean, and our trade with the Tropics are insignificant compared with this traffic of the north Atlantic. This great flow of trade from West Europe to the Tropics should be remembered with reference to Chicago's future. We, too, have a potential highway leading to the Tropics, which we shall some day use.

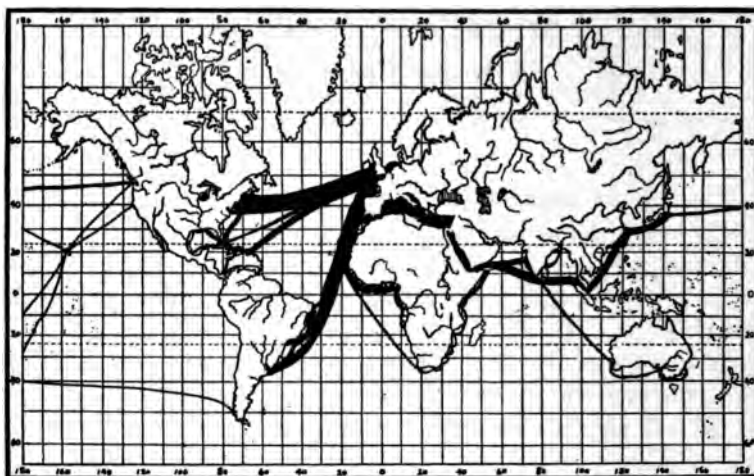


Fig. 19. The flow of ocean commerce.

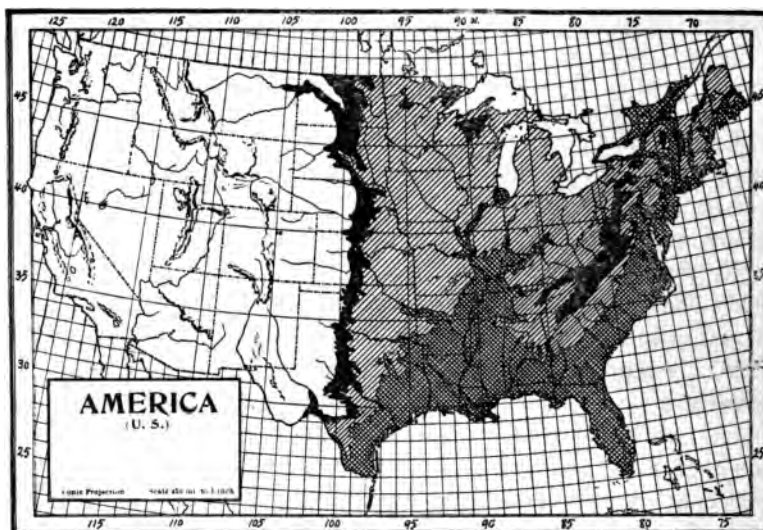
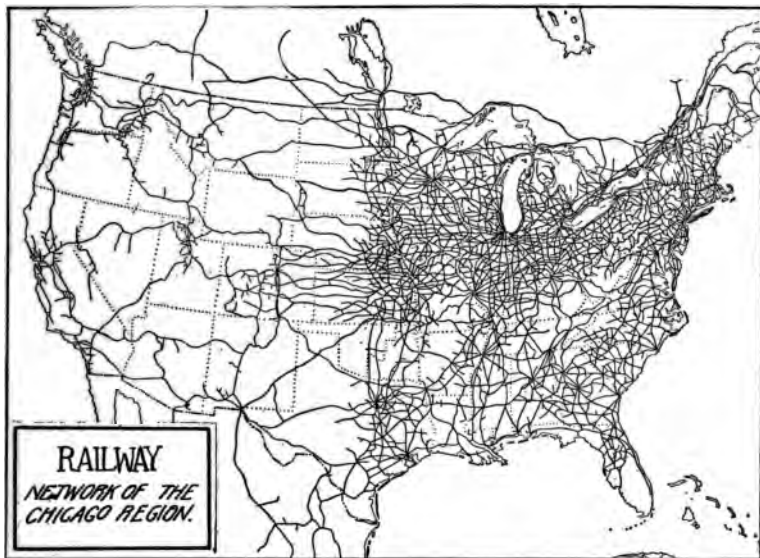


Fig. 20. Map of U. S. A. to show the eastern lowlands. Contours of 500, 1,500 and 2,000 feet. The cross-hachured area is less than 500 feet above the sea. The diagonal shading is land between 500 and 1,500 feet. The solid black is over 1,500 feet above sea level.

The next element of advantage in the growth of Chicago is the fact of our location in the heart of the great American lowland, which, smooth and fertile, covers the eastern half of our country. The significance of this is patent when we recall that over 90 per cent of the world's food supply and population are found on the land below an elevation of 2,000 feet. This great eastern lowland of ours in addition to a matchless climate, inviting the production of the great cereal and other crops, and the growth of forests, has the smooth surface which invites the building of roads and railways, and the use of labor-saving farming machinery. And this eastern low-



(Fig. 21.)

land compares favorably with all Europe in the productive power of its mines and soils. Chicago's superlative advantage lies in her position in the heart of this splendidly productive area. And in this area a peculiar influence compels the growth of a great commercial focus at Chicago, and that is the size and position of Lake Michigan, which spreads its awkward 300 miles of deep water right athwart the lines of east-west traffic, so compelling land lines of transportation to concentrate round the southern end of the lake. The flat land, the fertile soil, the markets at the east and the Great Lakes compel a metropolis at the place of Chicago. That is why the 27 railway systems focus at Chicago, making the greatest railway center on

earth. For railways are built where it pays to build them, where there is freight to be carried. Let us take an account of stock of the resources of the hinterland of Chicago, so we may be sure why we are great, and how much growth is yet to come from the resources assured.

2. The Hinterland

The region round Chicago, which looks to Chicago as the market of its chief commodities, and to the Chicago merchants for a goodly share of their purchases, is what is considered our hinter-



Fig. 22. The chief American coalfields.

land. Roughly, this is an area while only extending eastward into Michigan and Ohio, reaches on the south, west and northwest from 750 to 1,000 miles and over. This is an area rich in mineral resources, and the richest area of the size on earth in the matter of soils. It is this area which produces the most of the limestone and cement rock, which in 1906 were valued at \$55,000,000. The American output of coal, which in 1907 was 370,000,000 tons and valued at \$513,079,809, was about one-fourth of it produced in the Chicago area, and the great Pittsburg field, which produces nearly one-half of the American coal, is not so far away but it furnishes us a deal of coal and coke, both by lake and rail.

Then there are the metals. Very rich deposits of iron, copper, lead and zinc contribute to the wealth of the Chicago region. Of these, the iron output of the country was alone in 1907 worth \$529,-958,000, about 80 per cent of which was taken from the mines in the Lake Superior region. This iron is mostly worked up in the Pittsburgh region, because the coke, the limestone and the markets are there, and the Great Lakes provide the cheapest of all transportation. The map (Fig. 23) shows these relations, and it also shows us how

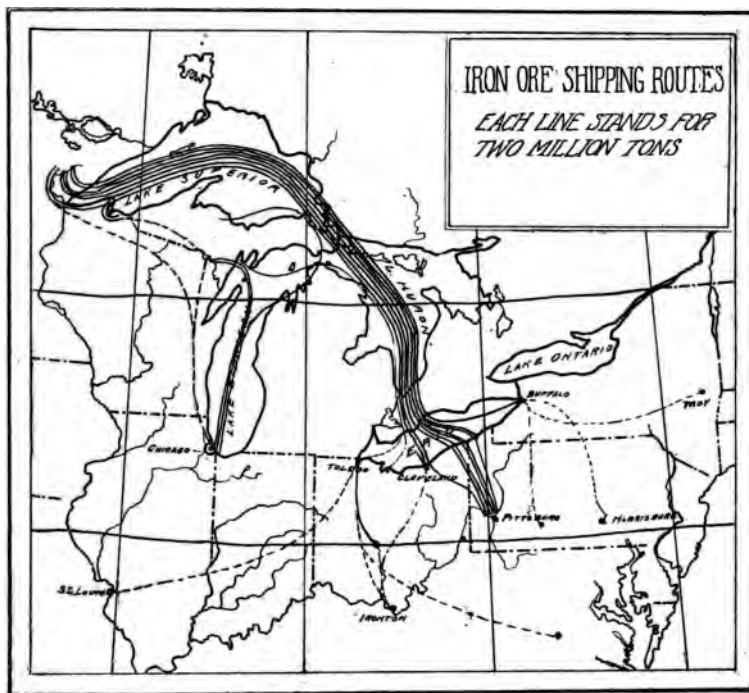


Fig. 23. The source and destination of our iron ore.

very small our share is in that iron industry. Cheaper (water borne) coal would give us a larger share. We could have the cheaper coal by supplying the waterways to the south—a thing we will do when we are awake to the opportunity.

But better than all the minerals and ores is the *flat land*, the *fertile soil* and the *good climate* of the Chicago area. A mine yields but one crop, and the resource is gone forever. But these rich soils will keep on producing their great crops for tomorrow's ten thousand years. And it is the crops from these rich farms more than all

the minerals which has made America great and Chicago a metropolis. The soils in the Chicago region (Fig. 24) are the richest on the continent. This is because they are new soils, contributed by the melting ice sheet of the Great Ice Age; soils gathered from the thousand miles of Canada passed over in the southward flow of the great ice. Such soils have all the constituents needed by vegetation. The area of this rich soil, once known, can be discerned in the maps showing the distribution of corn, wheat, oats, hogs, cattle, improved land, cities and railways. And we have only begun to develop the possibilities of this new soil. Let us look at a few of these rich crops, remembering that it is the toll on these commodities which has made Chi-

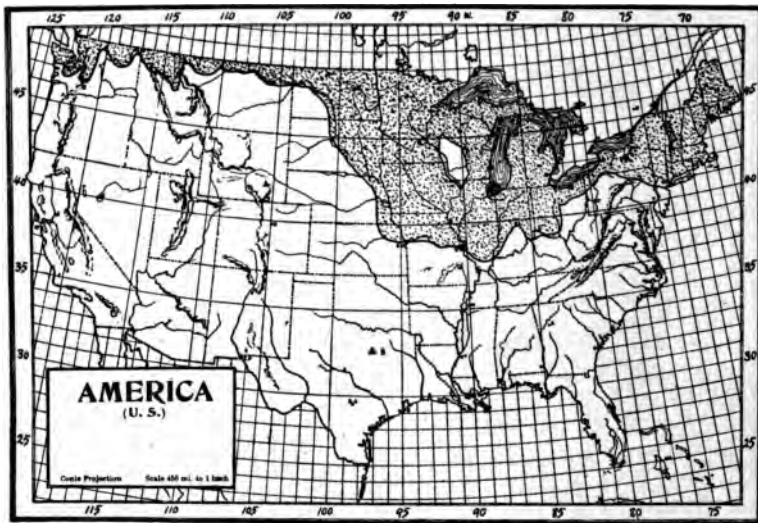


Fig. 24. Area of glacial soil.

cago grow great and New York far greater. They are the bank account upon which the Chicago of the future must draw in its growth.

The wheat crop of the country in 1907 was 625,576,000 bushels, valued at the farm at \$500,000,000. The center of wheat production is in western Iowa, about 400 miles west of Chicago. The surplus crop moves eastward to its market and throughout her whole history Chicago has levied tribute on the crop in transit. It has been one of the greatest sources of bone and sinew in our growing commercial frame.

The maize crop of America in 1907 was 2,553,732,000 bushels, valued in the farmer's crib at \$1,350,000,000—a sum equal to three-

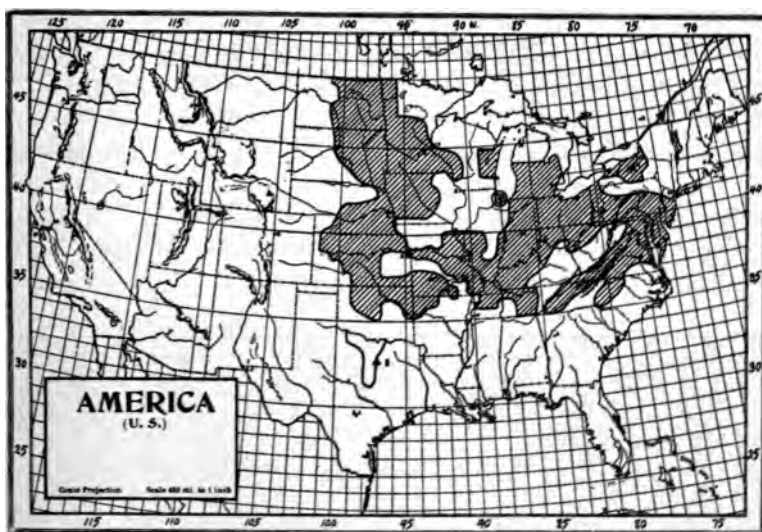


Fig. 25. The chief wheat producing area.

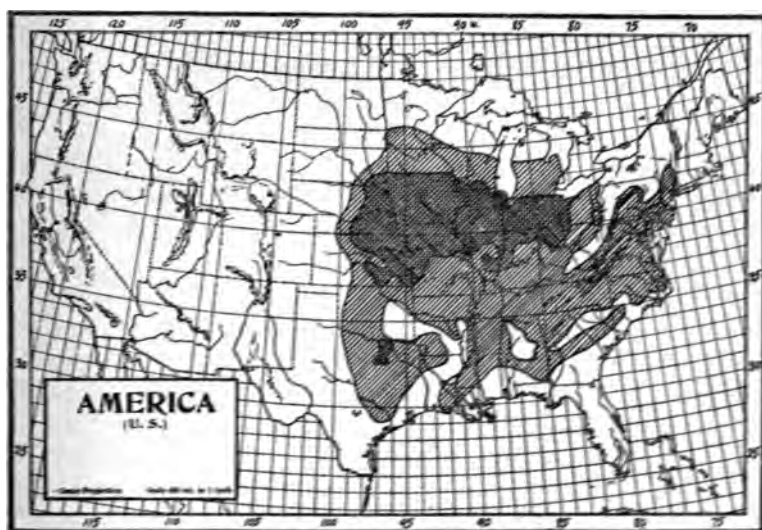


Fig. 26. The chief corn producing area.

fourths the value of the entire mineral output of the whole country in the same year. And this is the crude corn before it is converted into pork and butter and starch and glucose and the long list of other high-priced commodities which finally get to the consumer. Three-fourths of this gigantic crop is grown in the area commercially tributary to Chicago, and this city is its natural market.

One-third of this corn crop is fed to the hogs, and the swine map is quite the counterpart of the corn map. One could be substituted for the other. The year's swine are worth \$325,000,000 and most of them go to market by way of Chicago. Hogs and cattle have been far and away the largest contributors to the wealth and



Fig. 27. The area of maximum swine production.

upbuilding of Chicago, and it is as the source of meat foods that Chicago is known the world around. Chicago's easy supremacy in pork packing is shown graphically in Fig. 28, the recent slowing up in the rate of increase marking suggestively the rise of other packing cities in the corn and swine area.

The oats crop is a sort of understudy to the corn. In 1907 this crop was 741,521,000 bushels, valued at \$360,000,000. And again the lion's share of the nation's yield is in the Chicago area.

Hay, too, which has risen to second place in crop values, shows the same great concentration in the central lowland, and following corn and hay, the distribution of cattle discloses the old story of

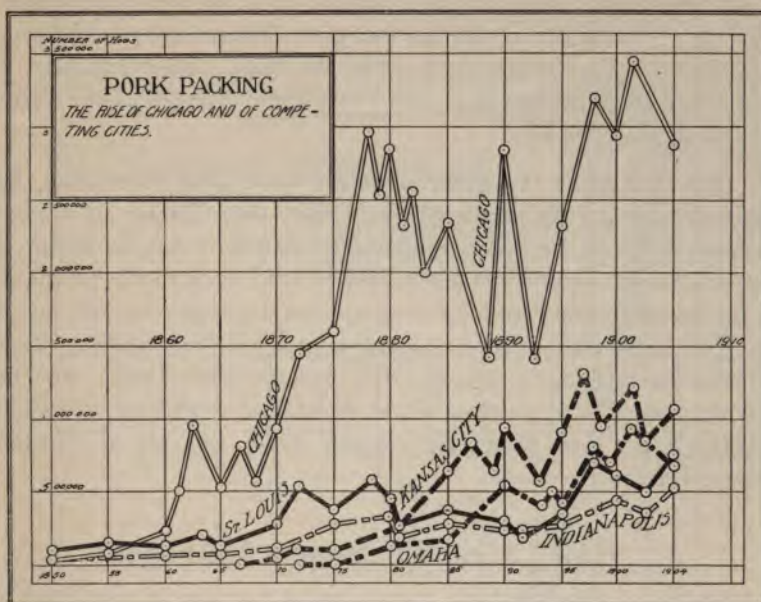


Fig. 28. The growth of Chicago in pork packing.



Fig. 29. The area of maximum cattle production.

maximum wealth in the Chicago region. Not on the Great Plains, but here on the rich corn lands looking to Chicago as the chief market, the bulk of the nation's cattle are kept. In every port of Western Europe the business men I met knew Chicago as the source of most of their imports.

Only a few of the great resources have been mentioned, but each one exhibits the one significant fact, that Chicago is a great commercial focus, because conveniently located to handle the products of the rich central lowlands, and to send back to the producers on the farms the multitude of commodities a prosperous and intelligent people demands. And Chicago is great in proportion as she is an efficient clearing house for this gigantic hinterland. For the hinterland of Chicago is one which in natural wealth and possibilities rivals not one European country alone, but all of Western Europe combined.

3. How Chicago Became a Metropolis

The opportunity to become a metropolis, and the measure of that opportunity are found in the wealth of the region to be served. Chicago's advantages are very great, but equally great are the advantages of St. Louis, save in one respect only—Chicago is on the Great Lakes, and St. Louis is not. In fact, St. Louis is better located than is Chicago with reference to the area of richest farming land; and almost as well located as Chicago with reference to transportation by rail with New York and the other North Atlantic ports. But these two cities have risen in the era of east-west moving traffic, and for this reason the Mississippi river has not been so serviceable to St. Louis as the Great Lakes have to Chicago. Many of us can remember the time when there was a rivalry between these two cities, for in the river steamboat days St. Louis was a dangerous rival of Chicago. The record of the rise of three cities, New York, Chicago and St. Louis (Fig. 30), is most instructive. The rate of growth from 1850 to 1870 was much alike in all three cities, St. Louis just ahead of Chicago and running neck and neck. From 1870 to 1890 New York and Chicago ran with an increasing rate of gain, St. Louis slowing down a little. From 1890 to date enormous gains for Chicago and New York, and St. Louis drops out of the race. Since 1870 St. Louis has largely lost her steamboats, and because of this has wholly lost her rank. Chicago, less advantageously placed than St. Louis with reference to the products to be

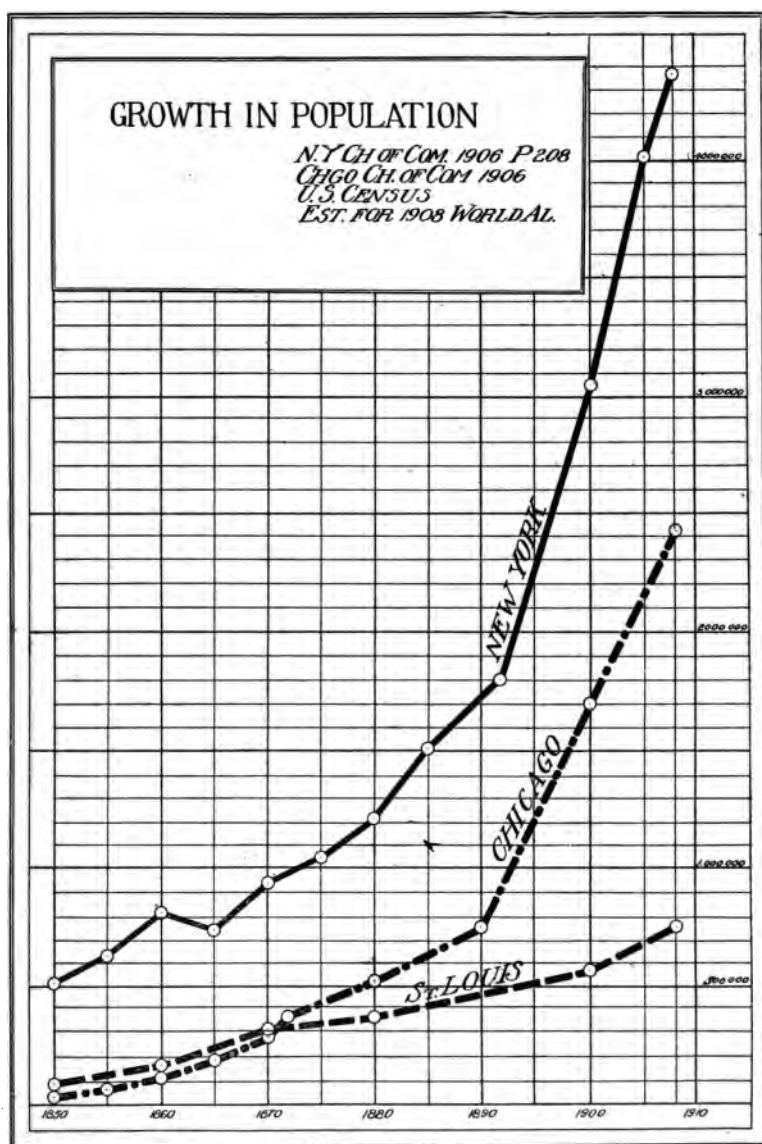


Fig. 30. The rise in population of three cities.

exported and the population to be served with westward moving freight, has forged ahead of all competitors to the commanding position of mistress of the great and immeasurably rich central plain, because *she had a choice in transportation routes to and from the east*. Economic freedom consists in having a choice. *St Louis lacked the water route to the east. Chicago was free. She had an option*. Her merchants could send their wares to the seaboard by water always at lower rates than by rail. We have the evidence on record in the case of some commodities. Take, for example, wheat,

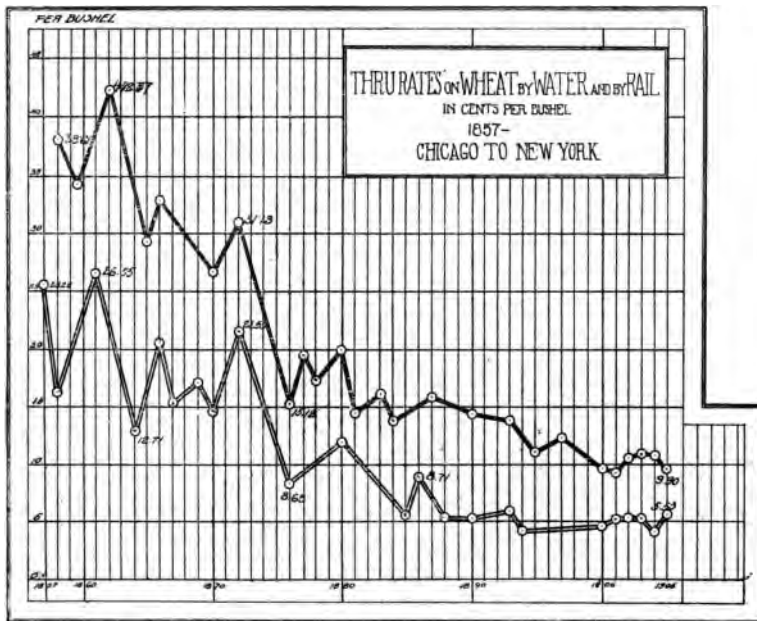


Fig. 31. Rates on wheat by water and by rail.

which was one of the largest contributors to the list of eastbound commodities during the period under study. The published rates for the all-rail haul Chicago to New York was, in 1862, 42.37c, and by the all-water route 22.50c. From this high point there has been a steady decline in the case of both water and rail, but always with the wide range of difference between them, the rail rate being from two to three times as high as the all-water rate. It is well to keep in mind that these are the *published* rates. We are all well aware that large and favored shippers have through the most of this period enjoyed much better, though unpublished advantages. Thus the Chi-

cago merchant has always had the superlative advantage of water competition on freights to and from the east. This does not mean that most of the freight has been borne by water. That is not necessary. The water route is closed nearly half the year. The railroads are in service at all times. The rail unit of car or train may go through unbroken. In the more important freight service by rail the time in transit is shorter. For such advantages one is willing to make some sacrifice and pay rates higher than by water. So the railways have done by far the largest fraction of the carriage. But the *potential competition* of the water route has always been a trump in the merchant's hand—and the railways have lowered their rates constantly to get the business. Such low rates naturally diverted a very large fraction of the east-west freight to the route along the Great Lakes, between New York and Chicago. This large flow of freight in turn was so great a prize for the railways that new railways have continually entered the field to get a share of it, and as a consequence by inter-railway competition the lowest freight rates in the world have ruled *between Chicago and New York*. We must not forget that these lowest rates have always been between Chicago and New York. Not between St. Louis and New York, or between Chicago and Baltimore or Philadelphia, the nearest Atlantic ports to Chicago. Every man in business knows, and every man in the street ought to know, that these low rates have been a special favor to New York and Chicago, and not to any other cities east or west. That these special favors have made it possible for these two cities to grow great, while Boston, Philadelphia, Baltimore and St. Louis have been kept in the background. And that this bestowal of rich favors in low rates and good service has accrued to New York and Chicago, not because of any special love the railways have had for the merchants of these two cities, *but for the sole reason that these merchants have had the active or potential competition of a water route in giving them a low rate*. These curves showing the growth of great American cities should be studied by the average citizen in all these cities favored or discriminated against, for in the final analysis the average citizen pays the freight, and the question of water competition in helping to establish low freight rates touches him most intimately.

And this point is of most significance to us in Chicago in view of the constant efforts, open and veiled, to suppress water competition and put the water traffic on the shelf. Chicago is great because of the water route to the east. The Great Lakes could not have

done the service alone. The Erie Canal has been quite as large a helper in our upbuilding. And it was our greatest good fortune that this is a state-owned canal, and hence not to be controlled in the interests of the managers of through rail service. How many efforts have been made by private parties to buy it up, or to cripple its service with one device after another! And that these methods have been successful seems patent. It has been reported before this Commission by a railway man in a position to know that "today the Erie Canal competition is ignored by the railways." To have the Erie Canal suppressed, and to have our harbor go into decadence is, for Chicago, to kill the goose that laid the golden egg. If the Germans had the Erie opportunity it would be a ship canal with 28 feet draft,

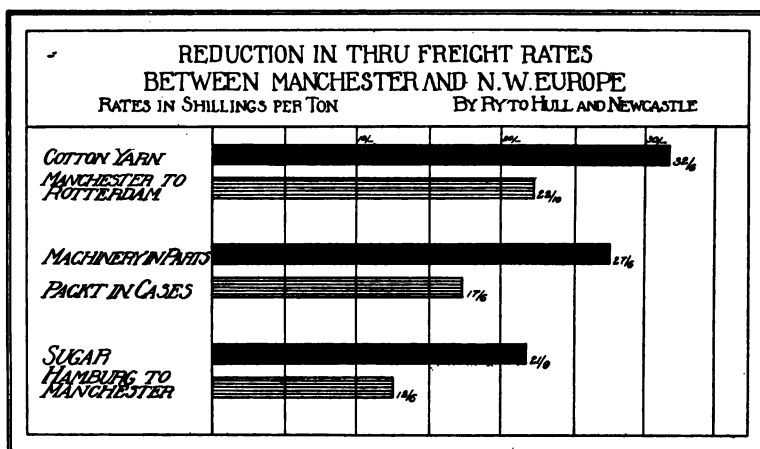


Fig. 32. Freight rates at Manchester.

locks 1,000 feet long, taking vessels from every sea to Chicago, and converting every lake port into an ocean port, and enormously expanding our commerce.

Manchester's experience in this connection is illuminating. For, like Chicago, Manchester is a city in the focus of a very rich and industrially active region. And the merchants of Manchester to do business with the outside world, had to accept the conditions imposed by the railways, and by the port of Liverpool. They felt that the rates were too high, both by rail and in the port. They plead for better conditions, but got no satisfaction and not much attention, until the people of the town decided to solve the problem once for all and bring the sea to their own doors. And when the canal was

authorized and work begun, rates came down. And when the canal was opened and the freight began to go past Liverpool without paying tribute, the rates came down again. The measure of the advantage to the people of Manchester is made graphic in Fig. 32, showing reductions of from 30 to 50 per cent in the freight charges on the chief commodities.

Since the growth of Chicago has been due to having a water route between the great central plain and the markets of the outside world, the logical conclusion is not hard to arrive at. It is of the most vital importance to Chicago to keep and to enlarge in every possible way the alternative of water facilities in transportation. And since it is perfectly patent that a large fraction of the wealth and commercial advantage New York enjoys is due to handling over the traffic to and from the rich Chicago region, it is high time that the people of Chicago begin to take measures for the establishment of deep water communication with the sea, so that we may collect the toll and reap the benefit of handling our own freight, rather than turning it over to New York.

4. The Manifest Destiny

The manifest destiny of Chicago is that she shall become the commercial focus between the rich central plain and all the rest of the world. To do this, one absolutely essential step is plain—*Chicago must become her own seaport*. And nature has been lavish in offering us opportunities for this ambition. A ship canal will bring the freight vessels of all the world to our own wharves. Our merchants may be independent both in importing and exporting in the service of the large and growing population in the Chicago hinterland.

The depth of channel requisite is shown in the studies of the freight traffic of many ports. Take, for example, the case of Glasgow. The records of the Clyde Navigation Trust show that of a total of 300 vessels of 22 feet draft and over entering the Clyde river in 1900, 100 were of 22 feet draft, 90 were 23 feet, 73 of 24 feet, 31 of 25 feet and only three each of 26 and 26½ feet. And in 1907 the same records show that in a total of 17,740 vessels entered at Glasgow in the year ending June 30, 1907, 11,256 were of 100 tons burden or less; 4,337 had a tonnage of 100 to 500 tons; 708 were of a tonnage over 500 and less than 1,000; 578 were over 1,000 and less than 2,000; 713 had a tonnage between 2,000 and 4,000; 144 between

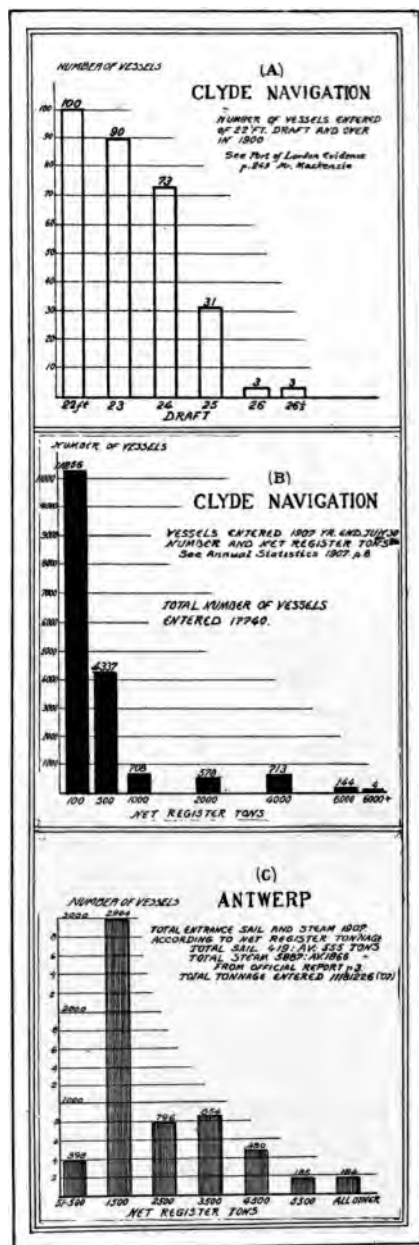


Fig. 33. The size of ocean freighters.

4,000 and 6,000; and only 4 of 6,000 tons and over. Again, in the case of Antwerp, in the year 1907 the total number of vessels entered showed, of sail, 417 with an average net register tonnage of 555 tons; of steam, 5,867 vessels, with an average tonnage of 1,866 tons. As to size, there were of steam vessels 398 with a net register tonnage of 51 to 500 tons; 2,964 with between 500 and 1,500 tons; 796 of 1,500 to 2,500 tons; 854 of 2,500 to 3,500 tons; 480 of 3,500 to 4,500 tons; 185 of 4,500 to 5,500 tons; and 184 of a tonnage over 5,500 tons.

The surprising thing to notice in all this is the small size of the vessels doing the freight service on the sea. These two ports are typical. The same record would be shown by the other great ports. The great leviathans with 35 feet draft and high tonnage are the few passenger boats and men of war. The freight they carry is an insignificant contribution to the traffic of the sea. The average freight boat of the sea is smaller, much smaller than the later and larger boats carrying coal and ore on the great lakes. A 28-foot canal would carry practically all the world's freight traffic boats to Chicago.

I asked the traffic managers in the various ports I visited as to the tendency of freight boats to grow larger. There is a well-defined opinion amongst them all that there is at present no tendency for the freight boats to grow larger. It is hard enough now for a 3,500-ton boat to get a cargo and run on a regular schedule. Moreover, it is not necessary to design boats even of much larger size to require more than 28 feet draft. And in the newer models the boat is given a broader beam and greater length in order to increase its carrying capacity rather than giving it a greater draft.

Our location is extremely fortunate in that it gives us three alternative routes for deep water channels to the sea. By the time our country has achieved the attitude of Germany toward the development of internal transportation all three of these routes will be developed.

The first of these routes is that of the Erie Canal. This lies in exactly the line to be of most service, as commerce is now organized, for it leads to New York, where freight opportunities are at present at the very apex of advantage. But we may be sure that this route will not be developed at the present time—for to the natural opposition of the railways will be added the entire opposition of the city of New York and all its mercantile and marine interests.

It would require the unanimous co-operation of all the rest of the country to secure a ship canal on this route against these interests.

The second alternative is a new route the Canadian government has under consideration at this time—a canal which will lead out of the Georgian Bay to Lake Nipissing, thence over the divide and down the Ottawa river to Montreal. The preliminary surveys are made for this venture and the engineers are working out the question of costs. This scheme is of the greatest significance to Chicago, for it will be seen by an inspection of a globe that this route will give Chicago practically a great circle route to Liverpool and the other ports of Northwest Europe, saving 774 miles over the present

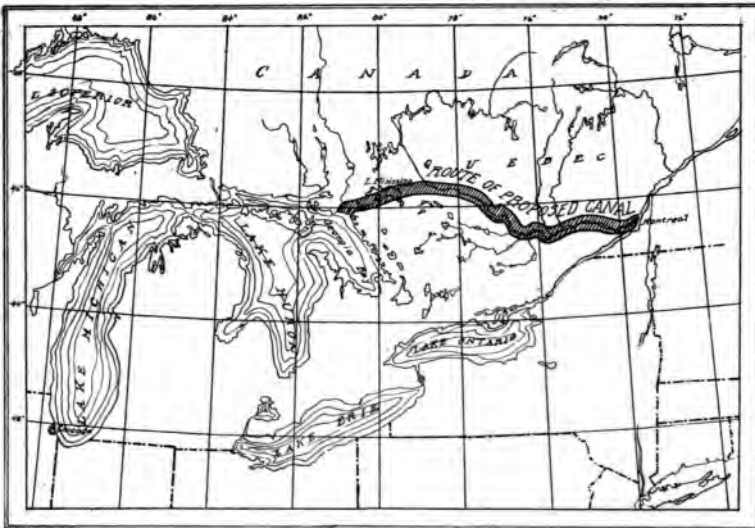


Fig. 34. Map showing the route of the proposed Nipissing Canal.

journey by way of New York. Another very patent advantage to us is that this route will give the Chicago merchant a choice again of playing the advantages of this route against the New York route, under conditions almost certain to assure the best service and lowest rates in the trade with Europe. And this advantage will accrue even if it should not prove advisable to bring ocean vessels through the canal to Chicago. The choice of routes will be enough to assure the Chicago merchants the same advantages they have had up to date by having more than one transportation interest eager to carry their goods.

The third alternative is equally fascinating, and that is the

making of a deep waterway down the Mississippi river to the Gulf. And in this connection we are not serious in calling 14 feet a deep waterway. Fourteen feet will do wonders, as the development of the Rhine and other rivers of Northwest Europe proves. But it might just as well be 28 feet, as it most certainly will be when we become alive to our opportunities.

We have not begun to appreciate our opportunities in water transportation on this great flat plain of ours. On a basis of 3 feet minimum draft we have in America now over 14,000 miles of navigable waterways, and this is measuring in smooth lines, not counting sinuosities. But our possibilities are vastly greater than this, for many streams not now navigable will furnish good navigation when canalized. It will be suggestive to place a map of the canals and navigable rivers of a part of the plain of Northwest Europe (Fig. 35) side by side for purposes of comparison, with an equal area in the plain about Chicago (Fig. 36). Then let us reflect that the Rhine carries more freight to and from the hinterland than the railways do, and let us think what our waterways, if given the same attention and opportunity as in Germany, could be doing for Chicago and the region tributary. For Chicago has, in the waterways present and potential of the Mississippi and St. Lawrence valleys, what is better than half a dozen Rhine rivers, ready to serve Chicago as the Rhine does Rotterdam.

Chicago's greatest opportunity in commerce looking to the future is toward the south. The distance from Chicago to New Orleans is just about the same as from Chicago to New York. The development of deep water transportation along the Mississippi axis will give Chicago a direct water highway to the vast future markets of South America. The completion of the Panama Canal will open the markets of the Orient to us. On the trade with South America the Chicago merchant may save on his freight the cost and time of the Chicago-New York trip. On all the Pacific trade he will save twice that. Thus the Chicago merchant will be independent of New York in all this trade. And he will have an added advantage in a water route to the Pacific ports of America, which will fix the maximum rates on the railway haul to the Pacific coast.

Considering all these opportunities, it is no exaggeration to say that there is no other such brilliant opportunity on earth for merchandising as Chicago offers. With the waterways of the great plain developed for craft of the size and character of the Rhine boats, the Chicago merchants may have absolute control of freight

rates and hence of the local market situation at every town along the Mississippi from St. Paul to the Gulf; on the Missouri river to the Great Plains; on the Ohio to Pittsburg, and on many tributaries to these main streams. And with the deep waterway to the sea, the import and export traffic with all the world may be handled with exactly the same opportunity for controlling the ocean transportation as is enjoyed by New York or Hamburg.

The deep water development of these commercial routes is sure to come. It is only a matter of education. The time we must wait will be short, in proportion as we are enlightened. And in its devel-

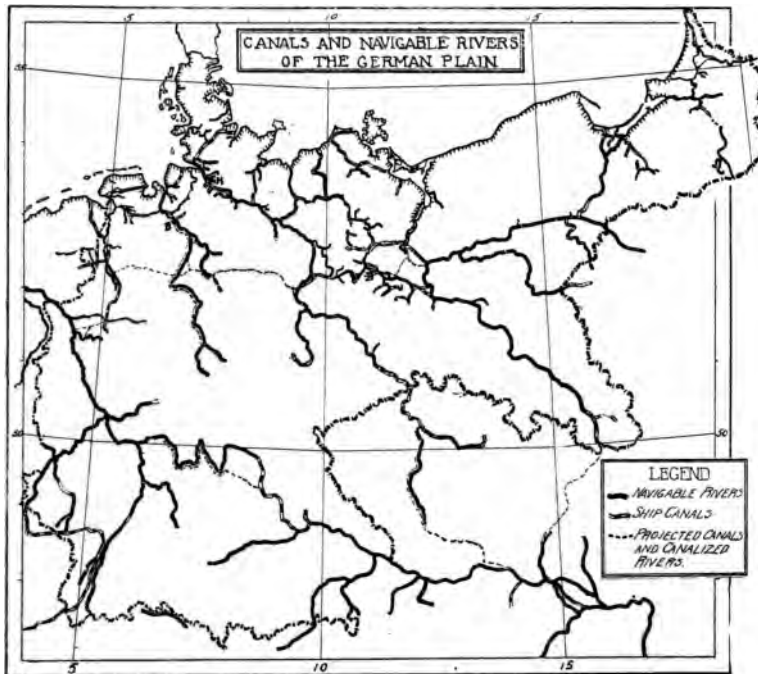


Fig. 35. Navigable waterways of the German plain.

opment the merchant and manufacturer of Chicago stands to gain immeasurably over any other possible commercial focus. On the experience of Manchester, Hamburg, Rotterdam and Antwerp in ventures already worked out and demonstrated as successes, it would pay Chicago to construct any one of the great ship canals single-handed and alone *if she could*. But in the nature of the case Chicago may not undertake any one of the ventures any more than Antwerp can. Since she cannot do it alone, it will be the part of wisdom for her to leave no stone unturned, politically or education-

ally, to advance in every possible way the development of any or all of these routes. *Economic freedom consists in having a choice*, and Chicago may just as well have not only an option between rail and water, but between alternative water routes to the markets of the Mississippi basin and to those of the world over seas.

The opportunity to keep our hold upon the present hinterland of Chicago is one few people realize, for we have only barely begun the development of this great area. To see the possibilities of the

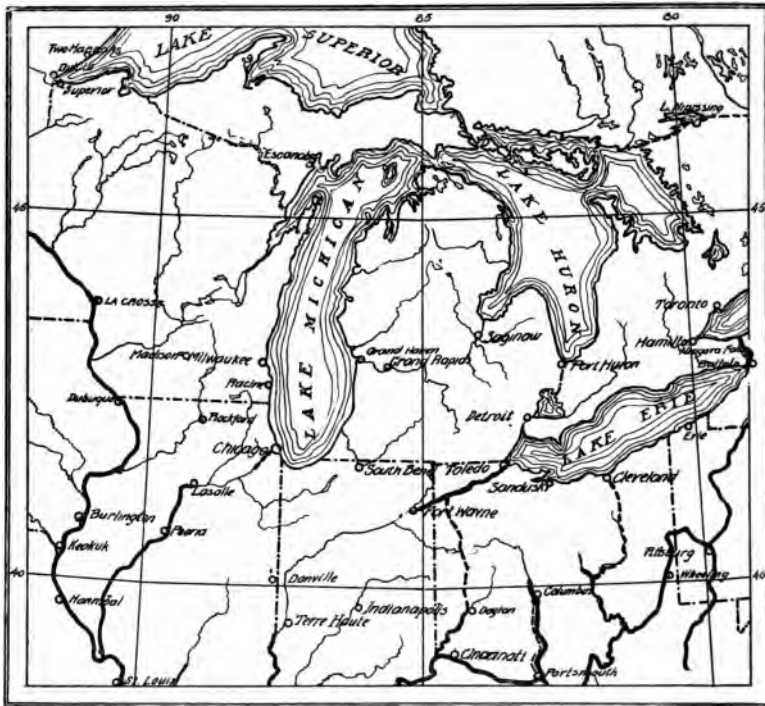


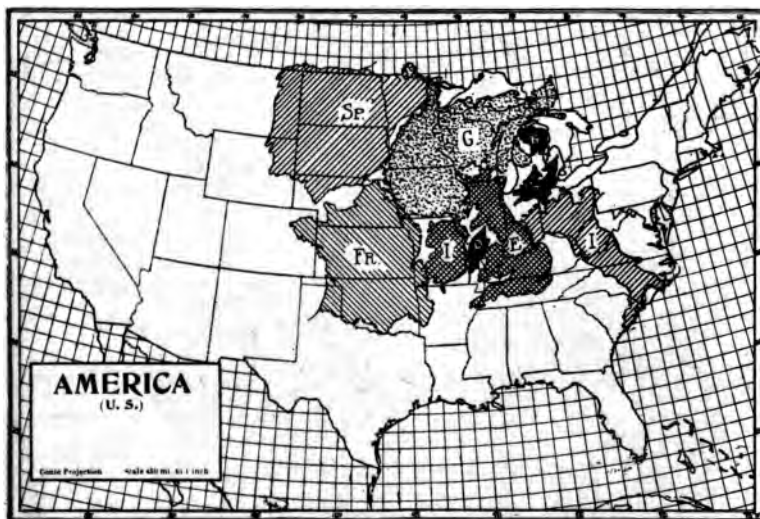
Fig. 36. A part of the Chicago plain equal in area to that shown in Fig. 35, showing navigable waterways.

region commercially tributary to Chicago one must put it alongside the highly developed lands of Western Europe. Climatically the parallel is good. As to mineral resources, the comparison again is fair. As to population, our blood and culture are the same, and standards of living are comparable. So what these European lands are now doing it is fair to suppose we may soon do.

Upon the area which we consider is commercially tributary to Chicago we can superpose the following list of countries, the pres-

ent populations of which are given to show what these lands are doing in the way of supporting people, compared with what our area is doing at the present:

Britain	42,000,000
Denmark	2,600,000
Germany	60,000,000
Holland	6,000,000
Belgium	7,000,000
Switzerland	3,315,000
France	39,000,000
Spain and Portugal	25,000,000
<hr/>	
Total	184,315,000



(Fig. 37.) The Chicago area with European lands superposed.

The American States in the Chicago area contain at present a population of 28,000,000. Thus the European countries of about equal area have a population seven times as great. These European countries, with the exception of England, Belgium and Germany, and to a small extent France, feed their people upon their own area. Yet in every case our area covered in this map is far richer and better able to support the large population than the European country is. At the rate our own population has increased the last half century, the 28,000,000 now tributary to Chicago will have become 252,000,000 within the present century. This *rate* at which

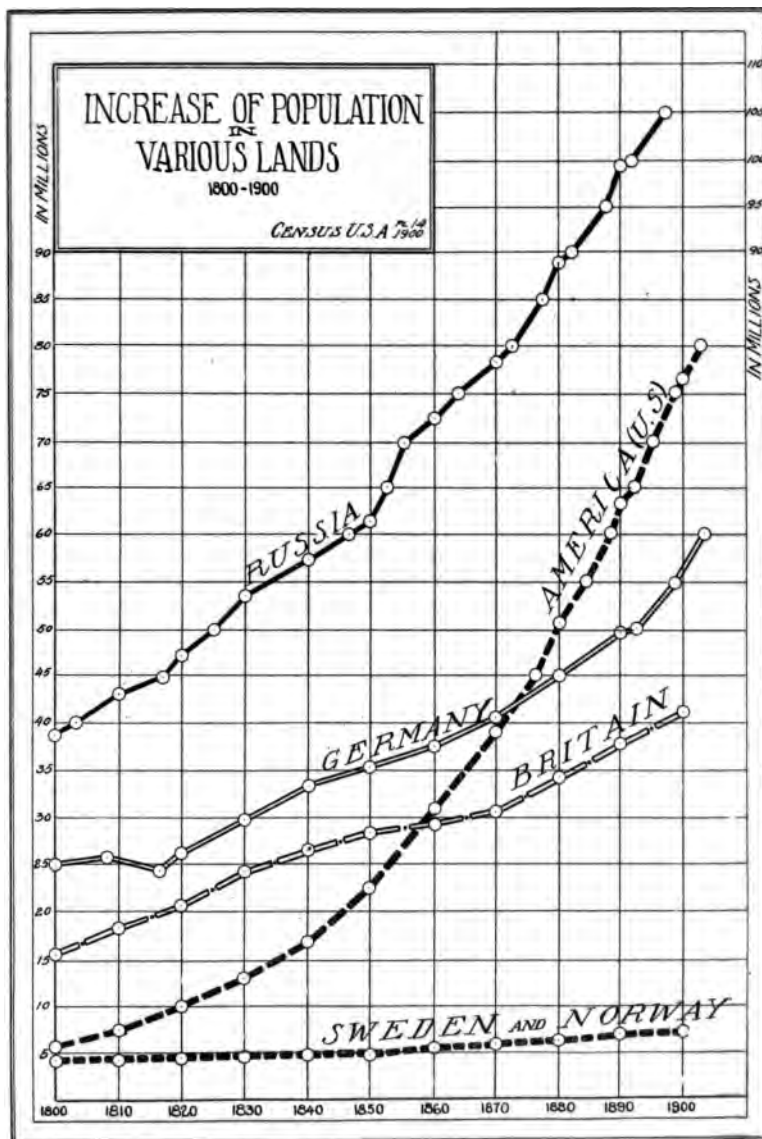


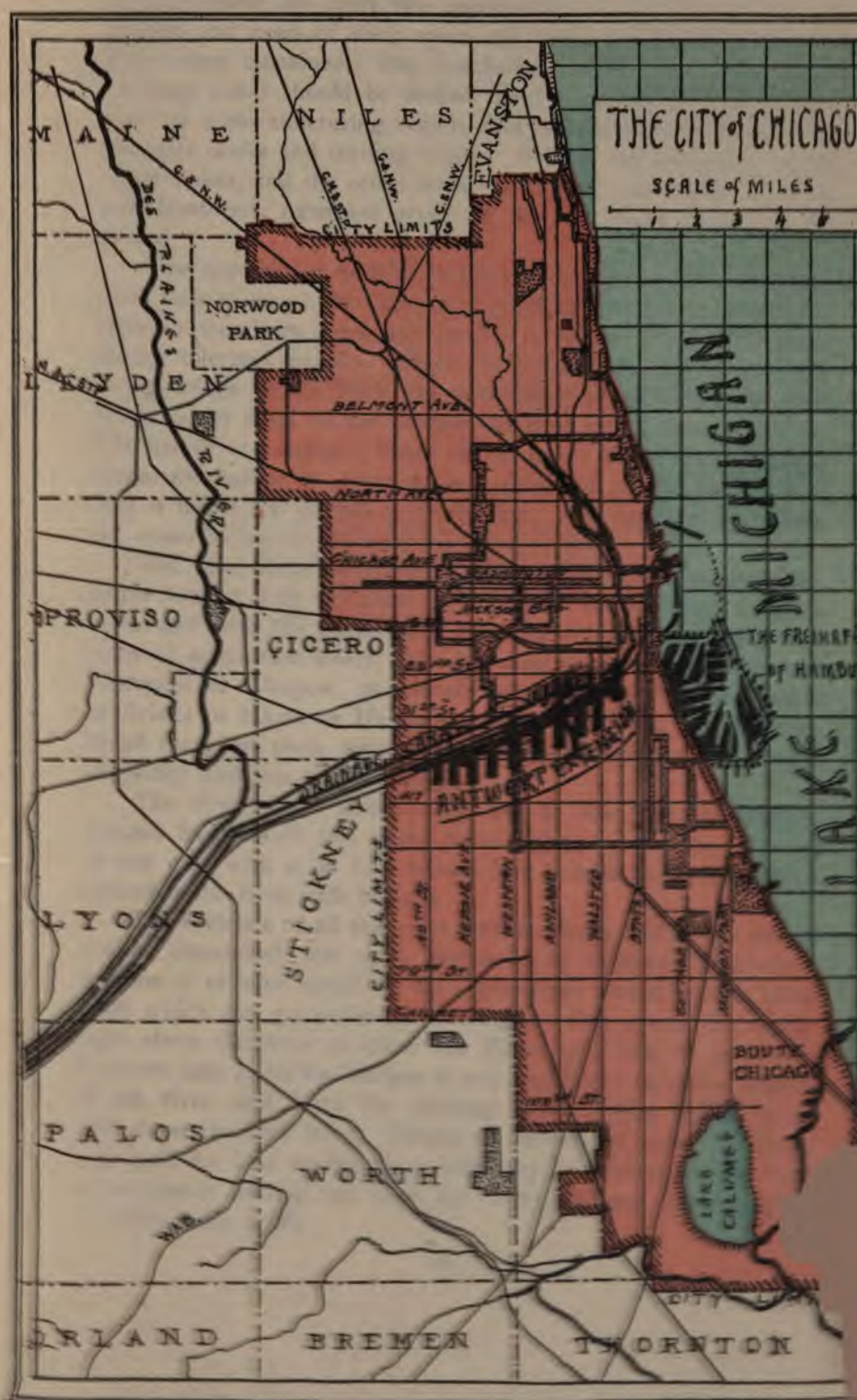
Fig. 38. Increase in population in various lands 1800-1900.

we are now growing may not last. But even if we adopt the rate at which old and stable Germany has increased, the Chicago area will have at the end of the present century a population of 100,000,000. But all over the world the cities are increasing in population faster than rural lands, and the largest cities have the fastest rate of growth. So a very modest estimate for the end of the present century would make Chicago a city of 10,000,000 inhabitants. This is the city, and this is the future it is our duty to plan for now. The possibilities are fascinating.

5. Planning for the Future

A mere enumeration of the natural resources of the Chicago hinterland, the scantiest catalogue of advantages Chicago has in her position in relation to commerce with this rich tributary area, the slightest acquaintance with what has been done within a century in the development of this region, must make one an optimist as to the future of Chicago. And we need to have the perspective such a study gives in order to plan at all for the future. With such possibilities in commerce before us how pitiful it seems, to be compromising on a 140-foot channel, and shying at sharp curves and projecting property in the only excuse for a harbor the fifth city in the world can claim for its own. The least that can be done is to plan for an immediate future we know will be ours: a harbor adequate for the ocean traffic a city of our rank will command; provision for the magnificent fleet of river boats we are soon to have. With this point of view let us look at the provision made in some of the world's great harbors for traffic they already have, and make close application to our own map.

Antwerp's present opportunity is only a fraction of what ours is to be within the century. Yet Antwerp has already adopted plans, and reserved the land for a harbor extension which is here shown to scale (Fig. 39) superposed upon the map of Chicago, and which makes our present harbor facilities look very small and cheap. Hamburg's prospects for traffic are not nearly so great as those of Chicago. Yet Hamburg has within a generation created a harbor which is already a candidate for first place among the world's great ports. The water area of the basins at Hamburg is here also shown to scale extending for five miles along our lake front. In the case of Hamburg this harbor area is considered as barely adequate for current commercial needs, and at Antwerp it is fully believed that the area reserved will all be



needed within the next two generations. Our possibilities of growth and need of dock space are much greater than both of these cities combined. The conclusion is plain, that the whole drainage canal should be looked upon as a harbor for development as a manufacturing region, and suitable provision made for adequate docks and turning basins. But for the commerce of the Great Lakes, and the ocean boats which may come from the East and Northeast, extensive areas on the lake front should be reserved.

The question of bridges in the present river is one which almost puts it out of the question to look for the conversion of the river in the down town section into a harbor at all. No great harbor tolerates bridges. There are none on the Clyde, only one swing bridge on the Tyne, the two high bridges permitting ships to go under them as the bridges on East river, New York, do. The harbor at London is below the bridges. There are no bridges across the harbor at Antwerp, and almost all of the harbor business is below the bridges at Rotterdam. And again at Hamburg, the ocean harbor is wholly below the bridges.

The lake front offers a better site for harbor construction, better located with reference to the needs of the ships and the town, and with the engineering difficulties more simple, and with costs of acquisition lower, than is found for harbor extension at Liverpool or Glasgow, or Manchester or Newcastle, or London or Bristol or Havre or Hamburg. Only Rotterdam and Antwerp of all the great ports compare with it in convenience of location, simplicity and low cost required.

The demands of street traffic are of the first importance. London has carried two great thoroughfares under the Thames, in one case with a 30 foot tunnel over a mile long rather than encumber the river with bridges.

The evidence of all the great harbors shows that streets should not be obstructed, nor ships hampered by bridges. Hamburg's solution is to have canals on the upper river served by low lying craft which can go under fixed bridges. Our grades lie amply high above the river to allow the Rhine type boat to go freely from the lake under the bridges to any warehouse on either branch of the river, and down the drainage canal. Ships might lie at anchor on the lake front. Barges as lighters or even the Rhine boat built for lake service, may serve any warehouse on the river or on canals leading out from the rivers, without interfering at all with street traffic.

It would be immensely advantageous to the congested business center of the city to be free to expand to north and west with unobstructed streets full width. Fixed bridges offer a splendid architectural opportunity, and the river part of the city might become the most beautiful and attractive part of the town.

If the harbor were established on the lake front the connection with the railway systems could be very easily provided for, as is shown at Antwerp, Rotterdam and Hamburg. Harbor areas providing for water traffic on the largest scale in the world, are served by railways without interfering with the streets of the city any more than our belt lines now do. And Hamburg is laying out now, a new terminal railway system, in which the railway tracks are either elevated or depressed, and free from grade crossings. All service is to be electric, and every provision is taken to have the installation efficient and unobtrusive.

In harbor administration the whole list of ports studied shows that greatest efficiency has been coupled with the nearest approach to monopoly in the management of all the service of transportation in the port. Outside of Liverpool, where the national laws make a trust an easy venture, the best examples are Rotterdam, Antwerp and Hamburg, where the harbor affairs are purely and simply a part of the municipal government. It is my conviction that such an organization is much more likely to be permanently successful with us. But in these cities the men chosen as heads of departments are of the highest ability and training, and have the advantage of the best expert advice in all their undertakings. The harbor board or department put in charge of these matters should be given definite and far-reaching powers. Among these powers should be the power to take land by purchase or otherwise for harbor extension or improvement; power to build and operate wharves, docks, sheds, warehouses, railway tracks and other freight handling facilities.

The experience of Manchester shows that such power should be given as would enable the harbor authority if necessary to become a terminal railway company to serve all the wharves and connect with all other railways. Such a terminal railway company would go farther to ensure a proper handling of freight to and from the boats in our harbor than any other provision that could be made.

If such a harbor authority could be so organized as to bring to its service men of the highest ability and experience, men who

represent Chicago, and not special interests, men who could have the united support of the brains and wealth of Chicago behind them, Chicago may come to her own; a marvelous commercial plexus, the metropolis of the New World.

Chicago's manifest destiny is plain. It is to be the world's greatest entrepot. Importing from every foreign port, exporting to the ends of the earth. With fleets of her own river boats of the Rhine type plying on a grander network of waterways than even Germany has yet planned. With other fleets of ocean going steamers free to go on three different routes to the sea. On a par in the world's trade with New York, London, Antwerp, Hamburg. The magnitude of her trade limited only by the possibilities of her hinterland, the richest on earth. Our future is as great as we are wise enough to make it. Our limitations are human and social, not in the opportunities nature has given us.

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